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Close-tolerance Castings

Materials and Methods, an American magazine, defines a close-tolerance casting by the following statement:—"The term 'close-tolerance casting' has been coined to mean castings where the as-cast dimensions or restricted areas can be held to tolerances in the range of ±0.001 to 0.005 in. per in., or ±0.010 to 0.020 on overall dimensions." A rider is given, which reads "It should be borne in mind that when a foundry specifies that commercial tolerances in this range can be held, this should not be taken as a guarantee that all dimensions of any part can be held to these limits. It merely means that if the part lends itself to that particular casting method, and if designed properly, dimensions on certain critical areas of that part may be held to these tolerances. Actual commercial tolerances possible on any dimension of a part can be accurately predicted only after consultation with the engineers in the foundry."

That seems a fair statement, but its implications are wide. It defines a product situated a little below "precision castings," but it may embrace very-high-grade repetition sand castings, and on the other hand exclude shoddy shell-moulded components. The specifying by a buyer of "close-tolerance castings" would enable the foundry to choose a process promising to give the best results at an economic price. Dimensional accuracy is not the sole desideratum in the acceptability of a casting, and soundness and surface finish are often of equal importance. The number of processes available for the making of close-tolerance castings grows yearly. There are, of course, the precision methods, based on the lost-wax process; die-casting which has been extended to include grey iron; shell-moulding (but with lower dimensional accuracy) with a number of interesting variations; CO_2 method; ceramic and plaster moulds and castings made by a number of repetition—both ferrous and non-ferrous—founders, who have so perfected the classical techniques that they also enter this field.

The article cited carries a Table which includes quite substantial data on the relative potentialities of the various processes, designed to make "close-tolerance castings," and it is interesting to note that, according to the figures quoted, it is the shell-moulding process which has carried production into the maximum weight range. Weights of 600 and 800 lb. are listed as the heaviest castings respectively made by the die-casting and shell-moulding processes, but the latter shows some advantage in surface finish as it yields a figure of 60 R.M.S. units as against 100 to 125 with what the Americans call the permanent-mould system. When thinking around close-tolerance castings, the behaviour of the different alloys must be borne in mind, especially by designers, who need—in their quest for reducing machine-shop costs—to maintain the closest co-operation with founders. For the latter, we counsel emulation of the standardization authorities, that is, for them to issue for each job a specification which they can meet and beat.

Dinners

JOINT IRON COUNCIL

The annual banquet of the Joint Iron Council was held last week, with Mr. N. P. Newman, J.P., presiding, at the Dorchester Hotel. Included among members and guests at the high table were: Sir George Barnett; Mr. John Bell; Sir Edward Boyle, Bart., M.P.; Mr. T. Brown; the Rt. Hon. the Viscount Bruce of Melbourne, C.H., M.C., F.R.S.; Mr. Charles Connell; Sir Walter Drummond, M.Inst.C.E., M.I.Mech.E.; Lieut.-General Sir John Eldridge, K.B.E., C.B., D.S.O., M.C.; Sir Lincoln Evans, K.B.E.; Sir Archibald Forbes; Sir John Green; Mr. F. Arnold Greene, M.I.Mech.E., M.I.E.E., M.I.Chem.E.; Brig.-General Sir Harold Hartley, K.C.V.O., C.B.E., M.C., F.R.S., Hon.D.C.L., Hon.D.Sc.; Sir James Helmore, K.C.B., K.C.M.G.; Sir Hubert Houldsworth, Q.C.; Lieut. Colonel H. H. Jackson, O.B.E., M.C., T.D., D.L., J.P.; Mr. V. Jobson; Mr. Henry F. H. Jones, M.B.E.; The Rt. Hon. the Lord Layton, C.H., C.B.E.; Sir Percy Lister; Mr. F. N. Lloyd; the Hon. Richard Lyttelton; Mr. T. A. McKenna; Mr. S. W. Martin; Mr. J. R. Menzies-Wilson, O.B.E.; Sir Percy H. Mills, Bart., K.B.E.; Sir John Morison; Professor Sir Eric Rideal, M.B.E., F.R.S., D.Sc., F.R.I.C.; Mr. Francis Rogers; Mr. S. H. Russell; Sir Frederick Scopes; Mr. James Shaw; Mr. J. J. Sheehan, B.Sc., A.R.C.Sc.I.; Mr. R. M. Shone, C.B.E.; Mr. D. O. Sillars; Sir Harold Smith, K.B.E., D.L., J.P.; Sir Rowland Smith, M.I.Mech.E., F.R.S.A.; Mr. J. F. Stanier; Mr. A. Watson; Mr. Andrew Whyte; Mr. FitzHerbert Wright.

BRITISH BRONZE AND BRASS INGOT MANUFACTURERS' ASSOCIATION

The Rt. Hon. Geoffrey Lloyd, P.C., M.A., M.P., the Minister of Fuel and Power, was present last Saturday evening at the annual dinner of the British Bronze and Brass Ingot Manufacturers' Association, held at Grosvenor House, Park Lane, and presided over by Mr. G. T. Whitehouse. At the president's table were Mr. T. B. Henderson; Mr. J. F. Turner; Mr. W. R. Marsland; Mr. R. W. Coley; Mr. L. H. Cleaver; Mr. D. Fishwick; Dr. C. J. Smithells; Mr. O. G. Helliwell; Mr. G. E. Jewell; Mr. F. Hudson; Mr. J. Bell; and Mr. B. T. Davies, most of whom were accompanied by their ladies. An excellent cabaret show, provided by the "Eight Champagne Girls," was preceded and followed by dancing.

Board Changes

WOLVERHAMPTON METAL COMPANY, LIMITED—Mr. A. M. Anderson has been appointed a joint managing director.

H. & J. HILL (WILLENHALL), LIMITED—Mr. Frederick P. Webster has joined the board and that of the subsidiary, George Dyke & Son (Willenhall), Limited.

VACUUM BRAKE COMPANY, LIMITED—Following the acquisition of the capital by Birfield Industries, Limited, Col. Harry Gresham has resigned as managing director. The board has been reconstructed as follows:—Mr. Herbert E. Hill, chairman; Mr. Michael G. H. Brown, deputy chairman; Mr. William G. Pallett, managing director; Mr. Sydney Walker, joint managing director; Mr. R. H. Harvey, Mr. W. F. Hardy, and Mr. A. S. King, directors.

THE fifth (plenary) World Power Conference is to be held in Vienna from June 16-23, 1956.

Fulmer Open Day

About 300 guests and the staff of the Fulmer Research Institute, Stoke Poges, Buckinghamshire, were joined by His Grace the Duke of Edinburgh at the luncheon which preceded the opening of the laboratories and workshops for inspection on Tuesday of last week. The occasion was also used for the formal inauguration of the Institute's new engineering laboratory.

The writer, of course, made a bee-line for "the foundry," only to find that it was perhaps a futuristic conception of a foundry which was represented. Yet perhaps the description was not so inappropriate, after all, for there are carried on basic processes for the extraction of metals from their ores and their preliminary casting into ingots and working into simple shapes suitable for further processing. Of particular interest was a direct-arc furnace for melting and casting reactive metals of high-melting point. This utilized a carbon arc directed on the metal to be melted carried on a water-cooled copper hearth and the whole contained in a chamber filled with argon under pressure. Also of "foundry" interest was a Durville casting machine, an indirect-arc furnace, equipment for vacuum melting and casting, and apparatus for the purification and sintering of chromium.

Extensive researches are being carried out in the laboratories on basic extraction methods for titanium and a surprising number of other long-term metallurgical projects is in hand at the Institute. For instance, low-cost steels are being developed which resist oxidation—in certain applications up to 900 deg. C.—as efficiently as expensive stainless steels. Aluminium extraction by catalytic distillation has now been developed at Fulmer to the stage when pilot production plants built in Canada are already earning a substantial dollar income by way of royalties.

The Institute was established in 1946 by the late Col. W. C. Devereux, C.B.E., and has several foundry firms among its subscribers. It exists to bring research facilities within the means of firms which themselves are unable to maintain a full-time research laboratory and therefore supplements the research associations (which handle problems common to an industry) and university and government laboratories. The Institute's services can thus be "hired" by sponsors on a non-profitmaking basis, excess of income over expenditure being converted into new equipment and facilities. Through its association with the light-metals industry, many of the researches have had a metallurgical bias. It is interesting to learn that over 1,100 investigations have been sponsored since the inception of the Institute, including many from government departments.

T.I. Research Fellowship

Applications are invited for the T.I. Research Fellowship tenable in Department of Metallurgy, University of Sheffie'd. The object of the Fellowship is to advance knowledge in the field of metallurgy; candidates should already have some research experience, but not necessarily in this field. Normal tenure will be five years, but the appointment will be for two years in the first instance and thereafter will be renewable annually. Stipend £750 for the first year, rising by annual increments of £50 to £950 per annum, together with superannuation provision under the F.S.S.U. A higher stipend may be paid to an exceptional candidate. Applications (3 copies) including the names and addresses of referees and, if desired, copies of testimonials, should reach the Registrar (Mr. A. W. Chapman, from whom further particulars may be obtained) not later than December 15.

Joint Iron Council

Year's Proceedings and Social Function Reviewed.

At the annual convention of the Joint Iron Council held in London last week the tenth annual report of the executive committee was presented from which the following extracts have been made:—

In presenting its tenth annual report, your executive feels that the year has been a memorable one for the Joint Iron Council through the high honour conferred by H.M. the Queen on its president, Sir Frederick Scopes. The executive would like to take this opportunity of recording appreciation of the services he has rendered to the industry over the whole of the six difficult years of his presidency.

The period under review is significant in that it coincides with the first complete year of the industry's operation under the Iron and Steel Act, 1953, and the Iron and Steel Board set up according to its provisions. During that period one very large producer of foundry pig-iron with its associated iron foundries has been "unscrambled," but a large proportion of the foundry-iron production is produced by companies owned by the Iron and Steel Realization Agency. The difficulties arising from de-nationalization can be said to have been anticipated by your executive, and the importance of some of these considerations was the subject of comment in the 1952 Report.

Iron and Steel Board

The Board was constituted in July, 1953. With the approval of the executive, a series of meetings between the whole-time members of the Board and the president and vice-president (accompanied by the director and other members of the executive according to circumstances) have taken place at approximately three-monthly intervals, beginning in October, 1953. One or two special meetings in addition have been held on particular matters. The executive has been kept fully informed, and no commitment has been entered into on behalf of either the ironfounding or iron-producing interests without prior consultation.

Important matters which have been discussed with the Board are the provision of the Board's income through a levy on the industry, notification of the provision of additional production facilities, notification of the closure of works, the finance of research and education, the collection and dissemination of the statistics of the industry, and production of iron castings in relation to raw materials.

Provision of Funds for the Board's Expenses

The scheme proposed by the Board, and subsequently approved by the Minister under section 13 of the Act came into effect on August 1. This requires a contribution of 4½d. per ton on steel ingots and 4d. per ton on all blast-furnace pig-iron other than basic iron for steelmaking, but no direct levy on iron or steel castings as such, as the inconvenience of levying large numbers of producers in varying amounts was fully recognized by the Board. This method of raising the Board's funds was broadly in agreement with the views put forward by the Joint Iron Council.

Provision of Additional Production Facilities

Iron and Steel Notice No. 1 of 1953 issued by the Board on October 23, 1953, required notice to the Board of any development estimated to exceed £100,000 in respect of any of the scheduled processes other than the casting of iron or steel. In accordance with the Act, the consent of the Board is required before proceeding. Detailed information in support of the scheme is required from the company.

Closure of Works

Notices were sent by the Board in March, 1954, to all concerns likely to be affected requiring notice of intended closure, three-months' notice to be given whenever practical. Only foundries with 100 or more employees, or other iron or steel producers with 200 or more employees, are required to comply.

State of the Industry

July, 1953, to June, 1954, was the first complete year since the war in which buyer's market conditions have applied to most sections of the ironfounding industry, and also affected the demand for some grades of pig-iron. This transformation of the balance between supply and demand has been brought about with only a relatively minor fall from the peak outputs achieved during 1951 and 1952. As well as the fall in demand which this drop represents, the effective productive capacity of the ironfoundries was greatly expanded at about the same time by the larger tonnages of pig-iron and scrap which became available. As a result, the level of ironfounding output is now almost solely determined by the state of demand, and a much greater output is attainable if required. However, a continuing tightness in the supply of some grades of pig-iron, even at the current level of demand, could mean that any large-scale ironfounding expansion would come up against renewed raw-material supply difficulties.

In the present outlook, there is little sign of any rapid expansion of ironfoundry output. During the last few months of 1953, there was a halfway recovery in the overall rate of production from the lowest recession levels, but during the first half of 1954, the position has been no more than maintained. However, total output for the year July, 1953, to June, 1954, at 3,670,223 tons was very slightly up on the previous year. If the present position is maintained for the remainder of the year, output for the calendar year 1954 will probably reach about 3.7 million tons, which is 1.7 per cent. more than in the previous year.

Certain sections of the industry's output, notably in the engineering field, have not kept pace with

Joint Iron Council

the expansion achieved by their user industries. This may be due to temporary causes quite apart from any permanent loss of markets, such as the tendency of many users to hold smaller stocks of castings as supplies became easier. Steel has become more freely available, and this has intensified the competition which iron castings have to face in some fields.

Although the overall position has been steady, the composition of iron castings output has continued to change, largely as the result of varying rates of expansion in user industries. Thus, automobile, building and domestic castings, and pipes, have shown a considerable expansion in the year under review. By contrast, the engineering and jobbing section suffered a further reduction in output of nearly 100,000 tons in the year to June, 1954.

There have also been considerable variations in the experience of individual producing districts. The two largest, Derbyshire and Nottinghamshire, and the West Midlands Counties, each increased their iron-castings outputs over the previous year; Scotland suffered the largest decline.

During the year under review, there was some tendency for scrap to be substituted for pig-iron. At 2,334,835 tons, the pig-iron charge was 1 per cent. down on the previous year, while the scrap charge (including own arisings) rose by 2½ per cent. There was a slight increase in the tonnage of hematite charged, and a fall for refined iron. A change in the classification of certain irons makes it difficult to interpret the returns for high- and low-phosphorus foundry iron, but there was certainly an increase in the usage of low-phosphorus iron, although the supply position remained tight.

Overall stocks of pig-iron at ironfundries have remained steady ever since the end of September, 1953. However, during the winter there was a fall in stocks of low-phosphorus foundry iron equivalent to three-weeks' consumption and the subsequent recovery has been small. To a lesser extent, there has also been a declining tendency in hematite and refined-iron stocks, while high-phosphorus stocks have increased. Scrap stocks also fell during the winter and have only partly recovered in recent months.

From July 1953 to July 1954, the ironfounding labour force fell by a further 2,118 to 139,002 workers. This is the first time that the labour force has been below 140,000 since 1947. Over the last couple of years, the labour force has fallen by considerably more than output. This reflects a higher tonnage output per man/year, but must give cause for anxiety for the future should a re-expansion in the labour force be required. The industry has lost over 17,000 workers in little over two years, and if full employment is maintained it may not be easy to win back large numbers to the industry. In the second half of 1953, the decline was virtually arrested, but has recommenced in 1954, concurrently with a drop in iron-foundry unemployment. In July 1954, it is estimated that this represented only 1.1 per cent. of the ironfounding labour force, which is the lowest unemployment figure for the industry since March 1952.

Finance

The problem of expanding the funds available for research, education and other activities of the Council has received active consideration throughout the year. The discussion at the 1953 convention focused on several alternative means, and it was decided to seek the co-operation of the Iron and Steel Board at an early date. In the course of the discussions it became clear that the Board would only exercise its powers to raise money for research when it was satisfied that the money could not be provided in any other way.

As was anticipated, the new terms for the grant by the Department of Scientific and Industrial Research to the British Cast Iron Research Association were based on a much larger initial industrial contribution, and a solution, therefore, became the more imperative. All member-firms will have received a letter early in August 1954, setting out the terms of the present proposals and inviting comment. These proposals are for an extension of the present levy to grades of iron not at present participating, and also some increase in the rate of the levy. The total sum envisaged is of the order indicated in the course of the discussions at the 1953 convention. The absence of comment on the proposals suggests that they will prove generally acceptable, in spite of some of the inequities which appear to be inherent in any practical solution to the problem.

Coal and Coke Prices

At the Joint Iron Council banquet in November 1953, Mr. N. P. Newman, chairman of the Council of Ironfoundry Associations, in the presence of Sir Hubert Houldsworth, chairman of the National Coal Board, drew attention to the importance of stabilizing the price of coal. Subsequently, a survey of the effect of coal price increases on pig-iron and ironfounding costs since 1947 was made on the instructions of the executive. Representations to the Government were made through the Federation of British Industries and other bodies and the pressure was maintained.

When, in spite of all assurances to the contrary, a further increase in coal prices was announced in May 1954, a detailed statement was at once circulated in the Council of Ironfoundry Associations' *Bulletin*, and copies were sent to members of Parliament, the Press and a number of industrial organizations. In this statement, the hope was expressed that the matter would receive the thorough and urgent attention of Parliament. A number of member firms are known to have supported this action by writing to M.P.s in their own constituencies. The failure of coal output to meet the needs of the country continues to cause the greatest concern.

Scrap

The Minister of Supply has retained his power to control the acquisition and the price of iron and steel scrap. There has been some relaxation in scrap licensing arrangements (now administered by

the Iron and Steel Board on behalf of the Minister), but this has not gone as far as your executive has thought desirable. Neither the Council of Ironfoundry Associations nor the Council of Iron Producers has given any support to the withdrawal of price control at the present time. The matter was fully discussed at the 1953 convention, and the views then put forward still represent the prevailing opinion.

Ferro-alloys

The bulk-purchase arrangements made by the British Iron and Steel Corporation Limited, as agent for the British Iron and Steel Federation, is being terminated and stocks will be dispersed. All participants were informed by letter in June 1954. Ironfounders and other consumers will be dependent on their individual buying arrangements from the end of the year.

Research and Development

Your executive has continued to foster in every way open to it improvements in materials and methods of operation in the industry. Research in blast-furnace operation is by a long-standing arrangement carried out by the British Iron and Steel Research Association, and the Joint Iron Council supports this by a grant out of its research and education fund.

On the foundry side, collective research is in the main the responsibility of the British Cast Iron Research Association which continues to derive the major part of its funds from the Joint Iron Council. Reference should be made to the 1953-54 report of the Association* for a detailed account of its work during the current year. Mention should be made especially of the continuation and extension of the work of the Operational Research (Advisory) Team and of the Foundry Atmospheres Committee; the two successful conferences on work-study run in conjunction with the Council of Ironfoundry Associations, and the extension of the advisory services made possible by the grant of Conditional Aid funds.

Mention should also be made of the work of the Technical Council of the Institute of British Foundrymen with the assistance of a grant from the Joint Iron Council on a variety of foundry problems, such as a study of the effect of internal stress in castings, mould drying, foundry coke, and the feeding of castings. During the year one sub-committee presented an interim report on cupola developments, which included valuable information on hot-blast cupola operation in this country.

Use has been freely made of the *Bulletins* issued at regular intervals by the Council of Ironfoundry Associations to encourage the wider use of the services available to the industry in the achievement of greater efficiency and to make known the improvements in both technical and managerial methods which are being developed. As an example, at the instance of the development panel, the C.F.A. Costing System is being expounded by two qualified cost accountants in a series of pamphlets, each dealing with one aspect or problem. These have a wide circulation among ironfounders, and some half dozen or so in the series have now been issued.

Health and Safety in Ironfoundries

The Iron and Steel Foundries Regulations came into effect on January 1, 1954, except for those on ventilation and on the provision of bathing facilities which are deferred until 1956. In their final form, they represent a wide area of agreement between the negotiating bodies and the Minister. Some difficult questions arising remain to be solved in respect of ventilation and the provision of protective clothing. A great deal of research needs to be done on ventilation and the Foundry Atmospheres Committee of the B.C.I.R.A. is active in this sphere.

The recently appointed safety committee of the C.F.A. is concerned with the development and encouragement of safer working practices, and a successful conference was held under its direction in March, 1954. A full report of the proceedings with diagrams and illustrations has been distributed to all ironfounders and to M.P.'s and others who have shown an interest in health and safety. The committee is now engaged in the preparation of a manual of safe working practices for ironfoundries.

The employers' liability aspect has been the subject of special study, and a well-attended session of the 1943 J.I.C. convention devoted entirely to the subject testifies to the recognition of its importance by ironfounders.

Your executive has noted with concern the undue prominence given in some quarters to reports of bad working conditions in ironfoundries and has under consideration steps to show in proper proportion the continuous improvement made over the years.

Training and Education

The appointment of a recruitment, training and education committee by the C.F.A. and of a training officer to the staff (through funds made available out of Conditional Aid) is enabling a closer study to be made of the requirements of the industry.

The Council has continued to support the National Foundry College and the National Foundry Craft Training Centre financially, both of which fill a definite need in the industry. The J.I.C. made a special grant of £5,000 to the College towards the equipment of the new wing, which was opened by the Permanent Secretary of the Ministry of Education in February, 1954.

Atmospheric Pollution

The appointment of the Beaver Committee and the widespread public concern in the matter led to the appointment during the year of a special committee of the Federation of British Industries, on which Dr. J. G. Pearce was invited to represent the J.I.C. A number of questions have arisen seriously affecting the industry, on which, after due consideration and with the advice of the B.C.I.R.A., an opinion has been given. The question of cupola emissions features prominently in this connection.

* See page 563.

Joint Iron Council

Census of Production

During the course of the year, a paper was presented on behalf of the Council to the Verdon Smith Committee appointed by the Board of Trade. This paper testified to the small value of the Census information to the industry and suggested a number of changes, on the assumption that it was likely to be continued in one form or another. Representations have also been made on the form of the 1954 Census, and some simplification seems likely as a result†

Statistics

The responsibility for the collection of the industry's statistics was transferred to the Iron and Steel Board early in the year. Discussions have taken place between the C.F.A. and the Board on the iron-founding forms, but no significant changes are likely for the present.

* * *

[Summaries of the principal production statistics for the year to June 30, 1954, and for the preceding year for comparison were appended to the Report, from which details of the production of iron castings according to use have been reproduced as Table I.]

TABLE I.—*Production of Iron Castings, according to use.*‡

	Main Fields of Consumption	1951	1952	1953	First Half 1954
		(tons)	(tons)	(tons)	(tons)
1	Building and municipal (pipes, gutters, manhole - covers, baths, sanitary goods)	263,072	266,635	293,799	149,033
2	Cooking and heating apparatus, including radiators ..	247,817	235,095	223,659	116,613
3	Other domestic appliances	16,298	12,630	10,768	6,517
4	Pipes and fittings for gas, water, sewage, etc.	589,556	615,615	683,338	364,108
5	Coal mining, quarry, clay and cement plant	62,037	65,683	61,040	31,122
6	Gas production ..	34,635	35,316	31,636	15,124
7	Electricity generation and distribution	109,912	105,081	80,761	42,966
8	Motorcar and cycle industry (excluding tractors)	294,157	283,713	271,357	152,014
9	Railway equipment	330,871	343,300	328,638	166,729
10	Shipbuilding and docks	109,518	111,329	103,795	50,345
11	Prime movers (turbines, engines) for land use, and transmission machinery	131,728	130,195	98,556	52,495
12	Boiler-house plant for industry, etc. ..	74,709	74,585	63,947	31,288
13	Agriculture and food processing (including tractors) ..	213,833	190,508	162,121	99,409
14	Machine-tools ..	202,711	213,548	182,711	88,571
15	Textile machinery ..	147,012	141,814	107,270	58,724
16	Valves, pumps and compressors ..	82,045	86,984	70,925	35,066
17	Chemical plant .	26,314	26,112	23,918	12,498
18	Ingot moulds for steel and non-ferrous metal manufacture	334,360	316,601	374,471	180,656
19	Iron and steel works' plant and rolls for mills	132,760	134,793	131,199	62,988
20	Cranes and conveyors for industry, transport, etc. ..	37,440	39,526	37,486	19,934
21	Printing and paper machinery ..	32,004	27,600	22,767	12,522
22	Balance (general engineering and jobbing castings) ..	279,662	301,795	274,267	142,791
	Total	3,752,451	3,758,458	3,638,429	1,891,513

† Printed in last week's issue of the JOURNAL.
‡ The table gives calendar years ; the figures for 1952 are 52-weeks estimates derived from official returns which were for 53 weeks.

ANNUAL BANQUET

Extracts from the Speeches

The annual banquet of the Joint Iron Council was held in the Dorchester Hotel, Park Lane, London W.1, following the meeting earlier in the day; the president, Mr. N. P. Newman, J.P., being in the Chair.

Proposing the toast of "The Joint Iron Council," Lord Layton, Chairman of the Consultative Assembly of the Council of Europe, said it was for him a very nostalgic occasion, for it meant returning to a very old love. Early contact with "ironmasters" and munitions production in world war I, was useful to him when he came to be concerned with the control of the steel industry, and finally appointed the first director of the Iron and Steel Federation. The foundations were then well and truly laid in regard to labour relations and those good relations were a great asset even to the present day. His directorship of the Iron and Steel Federation was much too short for him to be able to suggest that he was in any way responsible for the evolution of the Iron and Steel Industry of this country, but he did claim—and it was a minor claim—that when he left the Iron and Steel Federation he left behind an adequate system for providing production and other statistics—a system that was much more complete than any other industry possessed at that time. It was very difficult to over-rate the importance of adequate statistical information and he hoped that position was maintained.

Lord Layton continued by stressing the increased importance of the industry in export markets, outlining the constitution and policies of the Council of Europe *vis-à-vis* the European Iron and Steel Community, and ended by congratulating the industry on the degree of internal co-operation it had achieved.

THE PRESIDENT, MR. N. P. NEWMAN, who responded, said it was his pleasant duty to thank Lord Layton for the honour he had done them in gracing their gathering and to thank him for his most interesting remarks.

His second pleasant duty—and it was the first public opportunity he had had—was to publicly thank Sir Frederick Scopes, who had been president of the Joint Iron Council for six years (and whose place he had assumed) for the work he had done on behalf of founders during that period. Many present knew the times had not always been easy and were grateful for the time which Sir Frederick had spent on their business in spite of the many other heavy responsibilities which he carried.

Coal Prices Alarming

Last year when he had had the honour of replying to a toast proposed by Sir Hubert Houldsworth, he had risked suggesting that founders were very concerned about the upward trend in the cost of coal one of their most important raw materials. Worries had not ceased since that date and he thought it true that the rise in prices which took effect last year, through the increase in the cost of blast-furnace coke, would have cost their industry during the full year approximately £2 million. Today they faced a further potential increase in price of coke. Iron producers and founders were very alarmed at that constantly increasing cost of one of their most essential raw materials and he would be failing in his duty if he did not take the opportunity of once again expressing their concern. Mr. Newman went on to outline the work in the industry of the committee dealing with health and safety in foundries, paying tribute to Mr. C. Gresty, its chairman. Then he dealt with production in the industry, saying that the general trend led him to put forward an optimistic view. In conclusion, on behalf of the Joint Iron Council, he expressed appreciation and thanks to the staff for the hard work they had put in to make that evening a success.

SIR FREDERICK SCOPES, immediate past-president, and chairman of the Council of Iron Producers, then proposed the toast of "The Iron and Steel Board," thanking Mr. Newman for what he had said about his own services.

It was a great pleasure to him to be entrusted with that toast of the Iron and Steel Board, coupled with the name of its Chairman, Sir Archibald Forbes. There was a saying attributed to various people, that "happy is the nation which has no history." He thought they could say that during the last year the Board had not proved to be the ogre which some thought it might be and on the other hand it seemed quite true to say, and he hoped they would agree, that the iron producing and foundry section of the industry had not been as awkward as some imagined it might be. Sir Archibald was to be congratulated on having put through a levy of 4d. a ton on pig-iron and the assembly would be glad to know that they were playing their part in making the Board comfortable!

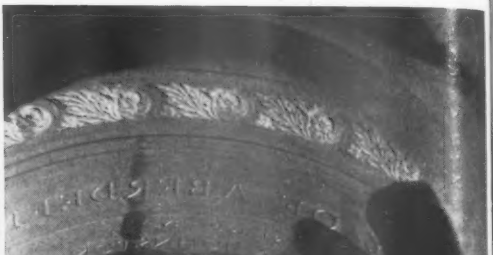
SIR ARCHIBALD FORBES, chairman of the Iron and Steel Board, responding to the toast, said he gathered from Sir Frederick Scopes that their relations with the iron industry continued to be friendly. The present was the first formal occasion on which the whole of the Board had been together, but although some of them were there on that occasion incognito, he was sure they would all heartily agree with him in thanking Sir Frederick for the way in which he had proposed their health and the way in which those present had responded to it. He had been particularly gratified to see no hesitation on the part of their sister organization in rising. He had thought in reading the annual report of the Joint Iron Council that there was a note of wistfulness in the sentence which said "it had become clear in the course of discussion that the Board would only use its powers to raise money for research provided they were satisfied the money could not be raised in any other way." There were not so many obvious attractions in being Chairman of the Board, but he supposed one did gain some experience which might be valuable in after life. The first duty of that Board was to exercise a supervision over the broad policy of the industry: it had not to take part in executive management. Executive management remained in the day-to-day affairs of the industry conducted with all the flexibility and decision of operational work and of the simulation of competition which represented the merits of free enterprise.

The Guests

MR. S. W. MARTIN, vice-president of the Joint Iron Council, proposed the toast of "The Guests," listing many by name and introducing them to his audience. There were present, he said, some nine members of Parliament, whom they were very pleased to welcome. They were delighted to have with them Sir Edward Boyle, Parliamentary Secretary to the Ministry of Supply, a new responsibility to which he had been appointed. The Council were delighted also to have so many representatives from the Ministry of Supply as their guests and particularly to welcome Sir James Helmore, Permanent Secretary, Ministry of Supply, and the Controller of Supplies (Munitions), Lieut. General Sir John Eldridge. It was also an honour to be able to welcome the chairman and representative of a great nationalized industry, Sir Hubert Houldsworth, chairman of the National Coal Board, and the deputy chairman, Sir Walter Drummond. Also present were Sir Godfrey Ince, Permanent Secretary of the Ministry of Labour and National Service, and Sir George Barnett, H.M. Chief Inspector of Factories; the British Iron and Steel Federation were represented by Mr. E. W. Senior, the commercial director and many others of its principal officials, all of whom were very welcome. Concluding his proposition with a long list of distinguished guests, he asked Lord Bruce of Melbourne to respond to the toast.

LORD BRUCE, Chairman of the Finance Corporation for Industry, Limited, responding to the toast, said it was a somewhat onerous task; he often wondered if the man who had to reply for the guests had had to get their consent to what he proposed to say. God help him, he would never get it! However, members had been given much food for thought: they had heard Lord Layton on the great problems of the iron and steel industry in Europe; they had also heard their Chairman and Sir Archibald Forbes on the great responsibilities and duties which they were carrying. Every one of the guests extended their gratitude to the Joint Iron Council for their charming hospitality and they wished the president every success in his great office.

THOMAS ROBINSON & SON, engineers, Rochdale—Mr. T. Furness has been appointed a director.



Gillett & Johnston, Limited, the Croydon bellfounders, have now finished the contract for the additional bells completing the St. Nicholas Church carillon, Aberdeen, and these illustrations show stages in the work:—FIG. 1 *the core has been prepared for one of the larger and heavier bells; note the vent pipe leading from the mould bed.* FIG. 2 *shows a workman putting finishing touches to the inscription carried on the cope mould.* FIGS. 3 AND 4 *illustrate closing and casting respectively, and* FIG. 5 *a group of the finished bells ready for despatch.*

High-temperature Melting and Pouring of Grey-iron Castings*

By Dr. Ichiro Iitaka and Kazuhiko Sekiguchi

One year after the experiments described in the Author's first report,† the same experiments were repeated and some related experiments were carried out by another person using different material. Measurements of hardness and external shrinkage and water-pressure testing were conducted just in the same way as before. The specific weight and the gas evolved on solidification of molten iron were again measured. The results of these experiments confirmed the conclusions of the first report, making the matter clearer.

Results

Hardness.—The two full lines A and B in Fig. 1 show the new results, curve B being the data of the experiment carried out about one month after the first experiment of curve A. The molten cast iron was, each time, heated to 1,500 deg. C. and poured after cooling to the respective temperatures. Although there are some differences in hardness values between the curves A and B, which were obtained at different times, the two curves have the same tendency. The results of the previous Report are compared in Fig. 1 in two dotted lines (*a*) and (*b*), (*a*) being the result for castings poured at temperatures of melting while (*b*) is the result for those poured at the respective temperatures after cooling from the melting temperature of 1,600 deg. C.

The two newly-obtained full lines have much the same form as the dotted lines of the previous report (absolute values are somewhat different due to the differences of time of experiment and of material used). The explanation given in the previous Report was thus confirmed by the experiments carried out by another person and with other material.

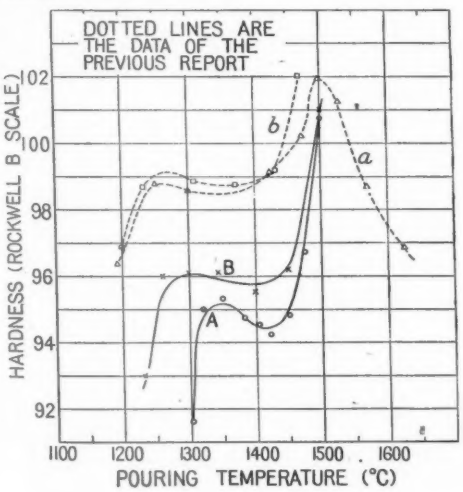
The results for outer shrinkage are shown by two full lines A and B in Fig. 2, the experiment, B, being carried out about one month after experiment, A. The result from the previous report is again shown by a dotted line. Curves of nearly linear-relation were this time obtained, as compared with the complex curve previously, the experiment not being extended above 1,500 deg. C. External shrinkage increases with rise of pouring temperature starting from a zero value at about 1,300 deg. C. The internal shrinkage must have a large value at low temperatures where the external one is very small or zero, and leaks will, in such case, occur on water-pressure testing. This conclusion of the first report is confirmed.

Water-pressure Test

The results of water-pressure testing are shown by two full lines, A and B, in Fig. 3. These lines differ in times of experiments, the molten irons being poured at the respective temperatures after cooling down from the melting temperature of 1,500 deg. C. The fact that A does not coincide with B had nothing to do with the conclusion derived. The results of the first Report are once more reproduced by the dotted lines, I is the curve for the castings poured at the melting temperatures while II is that for those poured after cooling to

* Second report on this subject published by the Castings Research Laboratory, Waseda University, Japan.

† Report No. 4, Waseda University (1953), published in the JOURNAL, November 12, 1953.



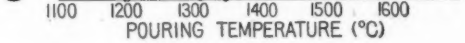


FIG. 1 *(left).—Hardness values for castings poured at various temperatures.* FIG. 2 *(below).—Relation between outer shrinkage and pouring temperature.*

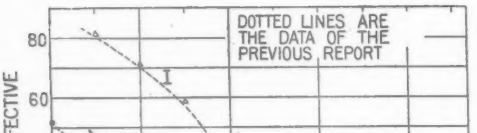


FIG. 3.—*Degree of defective castings according to pouring temperature.*

the respective temperatures from the melting temperature of 1,600 deg. C.

The newly-determined two full lines lie between the two dotted lines of last year's graph probably because 1,500 deg. C. was adopted this time as the melting temperature instead of 1,600 deg. C. previously. The full lines have not so good a shape as the dotted lines, but the result—that the degree of the defective castings decreases with rise of pouring temperature becoming zero at above 1,450 deg. C. or 1,490 deg. C.—parallels last year's observations.

Specific Weight

The specific weight was measured on ring specimens (cylinders of very short height) cut from the central part of the test cylinders shown in Fig. 2 of the first Report, that is, specific weight was measured at the part where water-leakage occurred, in the case of a defective casting. The results are shown in Fig. 4, in which A and B are the data of the experiments carried out at different times. Owing to the different experiment times, the specific weights on curve B are always about 1/700 larger than those on curve A. In both curves, however, the specific weight increases with rise of pouring temperature. And a relatively large difference of 5/700 (*c.* 0.7 per cent.) was observed between the specific weights at 1,300 and 1,500 deg. C. These facts are very important. The increase of specific weight means the material is becoming more dense and compact, that is, a decrease of sub-microscopic cracks; such castings better resist the water-pressure test. The decrease of the sub-microscopic internal cracks is due to a decrease of the internal shrinkage (increase of outer shrinkage). These relations are shown on the high-temperature pouring regions of Figs. 2 and 4. The reason for the fact that the castings poured at high temperatures give better resistance on water-testing was thus clarified. The castings poured at low temperatures have small external shrinkages (large internal shrinkages) and accordingly, have more sub-microscopic cracks, the material becoming coarse (small specific weight), so that it can less easily withstand the water test.

As the Authors have long been experimenting on the gases evolved on solidification of cast irons, the relations between these and the pouring temperature was studied by the same apparatus. The molten irons were teemed at various temperatures into a crucible and the gases evolved during solidifying were collected and analysed by an Orsat apparatus, both qualitatively and quantitatively. The results are shown in Fig. 5. The ordinate shows the volume of the total gases per 500 gm. of the molten iron in cubic centimetres.

The total volume of the gases evolved increases with rise of pouring temperature up to 1,400 deg. C. and decreases rapidly at higher temperatures, reaching the small value comparable with that obtained at 1,200 deg. C. The same results were obtained on repeating the experiment three times. The molten iron was, each time, poured at the melting temperature, that is, at the maximum temperature reached during melting. The total volume of the gases does not increase on pouring the metal at 1,400 deg. C. after cooling down from the melting temperature of 1,500 deg. C. That the evolving gases consist mainly of N_2, CO_2 and CO has been proved by many experiments.

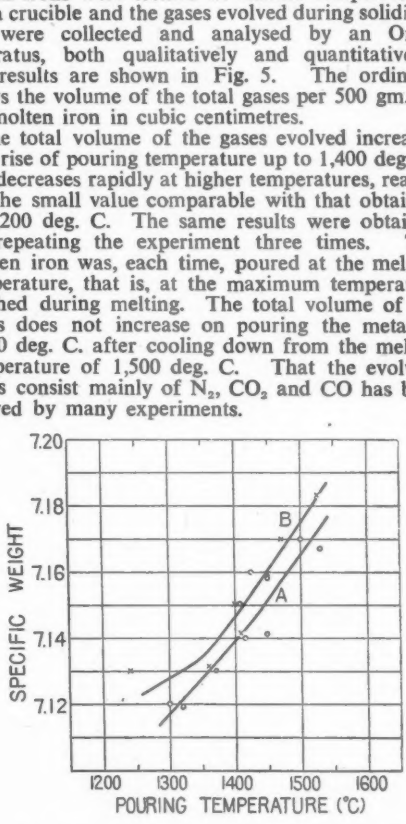
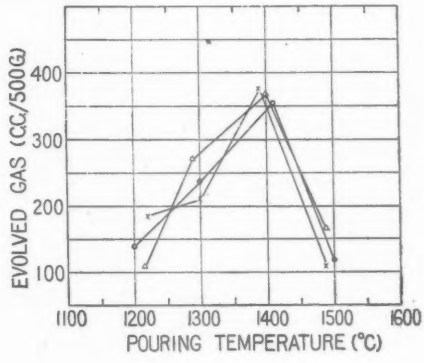


FIG. 4 (*above*).—*Relation between specific weight and pouring temperature.* FIG. 5 (*below*).—*Relation between gas evolved and pouring temperature.*



Correspondence

UNIVERSAL MOULD TOP-PLATE

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—During the early part of 1932, I delivered a lecture to several branches of the Institute of British Foundrymen which dealt with the economical production of medium and large castings, in particular machine-tool castings. During the course of the lecture I referred to the use of a universal mould top-plate which I had designed and employed on a large range of castings with a resultant economy of from 15 to 30 per cent. in the total cost of the casting, depending upon its design. There was also a reduction in the use of facing sands or loam to within about 10 per cent. of the amount formerly used when employing the orthodox sand-rammed top-boxes. The need for thousands of lifters (gaggers) was also eliminated.

From time to time I receive requests for particulars of this universal top-plate. To avoid further correspondence and repetition I am asking you to publish the following brief description of the equipment, and may I add that this plate differs very considerably from the orthodox loam-plate which is restricted to a particular design of casting or, at best, to a very restricted range.

Fig. 1 shows a universal plate 12-ft. square with a depth of 8 in. for which the particulars are briefly as follow:—

(1) The mould for the plate was formed from a series of half cores 1-ft. square, carrying elliptical hole cores. These made both the top and bottom of the plate. The faces of the plate, top and bottom, were marked with very shallow pips to help to secure the loam that was strickled on the surface.

(2) The design of the plate was such as to withstand repeated heating and cooling without early failure from fracturing that is so very common with the orthodox loam-plates.

(3) It will be noted that the plate is of a composite nature and consists of a 4-ft. square centre piece, C, an inner square, B, 4-ft. wide on each of its sides, and an outer square, A, with each of its sides 4-ft. wide. The sections were separated from each other by splitting cores 1-in. wide, but linked by a series of wrought irons stretched diagonally across the cored gap and protruding into the cast sections of the opposite members. This arrangement allowed for expansions and contractions by cushioning, somewhat, the stresses set up during heating and cooling from the casting operations. Some parts of the plate would receive a greater heat transfer than other parts.

(4) The arrangement of the elliptical holes (G) served for vents and the use of hook-bolts when there was need to secure cores to the top-plate.

(5) A number of holes (D) served to allow the formation of runner and riser-gate openings. The use of large feeders, in most cases, was abolished by the use of denseners.

(6) Lifting handles (E) served to manipulate the plate. With smaller plates, holes were formed in the vertical faces of the plates in which loose bars could be employed for handling.

(7) The end face of the plate at F served as a joint for another plate when more than one was needed to cover a mould. These plates would often extend to cover a surface 40-ft. long and sometimes even greater lengths.

(2) Either a flat or regular face could be formed on the face of the plate by the use of a strickle board pivoted in a centre hole.

(9) The plates are reversible and, in many cases, the loam is strickled on to the hot surface of the plate after a casting operation. Thus the heat of the plate serves to dry out the loam coating. Often the loam is formed to a depth of about ¾ in. to 1 in. by the use of metal strips laid parallel along two sides of the plate.

A number of universal plates, ranging in sizes of 12 by 8 ft. and 8 by 6 ft., served to cover a large range of castings.

Whenever the size of the universal top-plate justified it, the casting was of a composite nature as described and illustrated in Fig. 1, and was cast together from one ladle. The iron for casting the plates consisted of, approximately, 75 per cent. hematite and 25 per cent. textile machinery scrap; a high-carbon, medium-silicon, low-phosphorus metal being desirable.

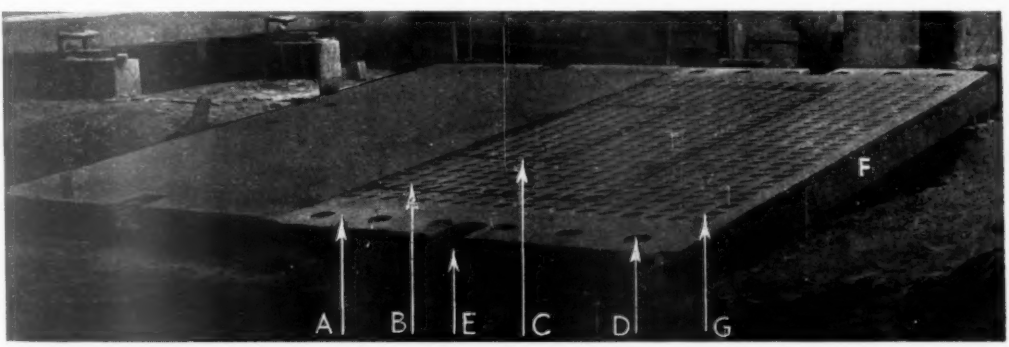
The 12-ft. square plate, shown in Fig. 1, was in constant use for over 14 years. The "life" of this kind of equipment depends upon the care taken to avoid excesses of temperature such as would be caused if molten metal were allowed to flow over the bare surface of the plate.—Yours, etc.,

E. LONGDEN.

Manchester.

DAILY MAIL "Ideal Home" exhibition 1955 will be held at Olympia from March 1 to March 26.

FIG. 1.—*Universal mould top-plate, consisting of three separate pieces linked by cast-in bars.*



New Equipment

Scrap-metal Baling Press*

The "Fielding" type S.C.B.I. hydraulic scrap-metal baling press, a new model made by Fielding & Platt Ltd., of Gloucester, is a small version of this type of equipment (see Fig. 1). It is a sturdy and compact unit, being fully self contained with oil/hydraulic pumping equipment, controls, etc., can be installed with the minimum of site, space and foundation requirements, and is suitable for converting ferrous and non-ferrous light sheet scrap metal into bales which can be conveniently handled for re-melting.

The baler can be operated simply and efficiently by unskilled labour, and this combined with its low maintenance costs makes it a suitable machine for duty in foundry scrap yards or any place where scrap handling is carried on. The size of the box is 36 in. by 12 in. by 12 in. deep (8 in. when closed) and a bale 12 in. by 8 in. by 6 to 18 in. (depending on material and loading of box) is produced, weighing from 28 lb. to 1 cwt. The estimated time cycle, excluding loading and unloading, is about 40 sec. and 35 to 40 bales per hour (depending on loading conditions on site), can be produced.

Initial compression of the bale is effected by means of the falling box cover actuated by a hydraulic cylinder and ram of forged steel and the final or horizontal compression is by means of a horizontal cylinder and ram mounted within the main frame of the press, the cylinder and ram being of forged steel, whilst the ram head, or pressing platen is of alloy cast iron. The pressing plate attached to the ram head is fitted with an alloy steel wearing plate as in the case of the box sides. A substantial door forms the end of the baling box, and this can be opened manually so that after a bale is compressed, the bale is ejected by further movement of the horizontal ram. For operating the press a two-stage radial pump is employed, and this gives a maximum delivery output of 2.25 gal. per min. at 2 tons per square inch. The pumping unit has its driving motor and overhead hydraulic oil-supply tank arranged on a combined motor and pump bedplate.

Segmental Fettling Burrs

A new range of segmented rotary burrs in tungsten carbide has been launched by Flexible Drives (Gilmans), Limited of Smethwick, Staffs. The use of such fettling tools has been standard foundry and die-sinking practice for many years, but it is claimed that the new "Segbur" range of tools (which have been patented by the company) will make the price of carbide burrs economic to all users. The "Segbur" range cuts Nimonic, manganese—and stainless—steel, hardened die-steel or any other hard metal. Worn segments can be replaced by the user; likewise, teeth can be re-sharpened as often as necessary, while the burr continues to rotate and it is claimed that the burr is equally effective over a wide speed range.

Burrs have proved useful in foundrywork in that, while working in high-speed machines, they permit castings and dies of intricate designs to be quickly hand machined. Furthermore they are made in a multiplicity of shapes to conform to the contours of the component. Thirdly, they are flexible in application and can be used where fettling chisels or grindstones are impracticable, as, for instance, in a tricky cavity of a die or casting, or on a weld. Burrs present a method of mechanizing one of the few remaining manual jobs in metal trimming.

Sintered Product

The tungsten-carbide burr—a logical development to deal with alloy-steel castings, heat-resistant and stainless steels, jet-engine steels, and the like, appeared to be limited in general use because of its cost. The elaborate tooth forms, ground from the solid, as with earlier steel practice, involved the use of diamond wheels. That, as well as the initial cost of the hard metal, put the price of such burrs out of reach of some potential users. The new "Segburs," however, are available at half the prices hitherto normal for tungsten-carbide burrs. The segments are moulded and sintered into various shapes and thus grinding from the solid is no longer necessary. The segments are assembled and brazed on to a centre column in any desired combination of shapes and this flexibility of assembly saves the costs of expensive jigging, for individual shapes. Fine- and coarse-tooth cuts are possible and all the basic standards are available in the two types.

What is claimed to be a noteworthy feature of the Segburs is the regrinding by hand. Owing to the special tooth formation, the cutting edges can be touched up to sharpness by light spinning on a wheel by hand or by holding a silicon-carbide lapping stick against the burr whilst rotating it in a chuck. The "Segbur" range which was demonstrated to press representatives recently, is in three grades: tough, for use on Nimonic; blue, applicable to normal work; and red, for employment with hardened die-steel, etc. The speed range is 3,000 to 16,000 r.p.m. The normal shank size is 6 mm., but ¼-in. and 8-mm. shanks can be supplied.

* See also JOURNAL July 17, 1952, p. 71 and 72.

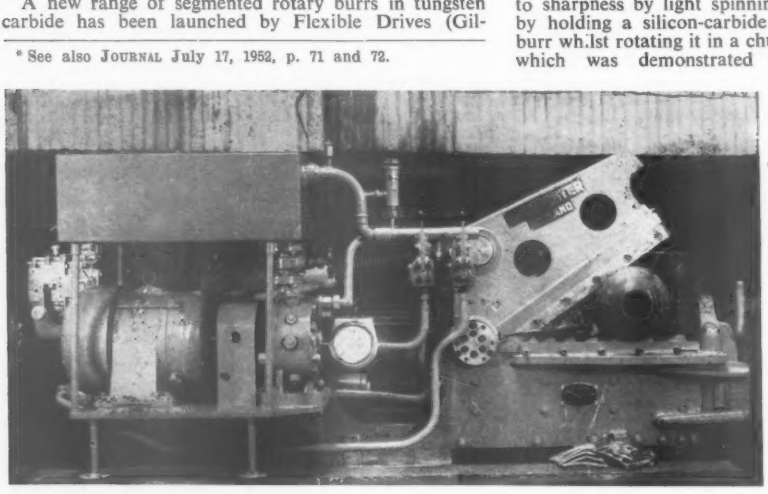


FIG. 1.—*"Fielding" hydraulic scrap-metal baling press, type S.C.B.I., on test in the makers' works at Gloucester.*

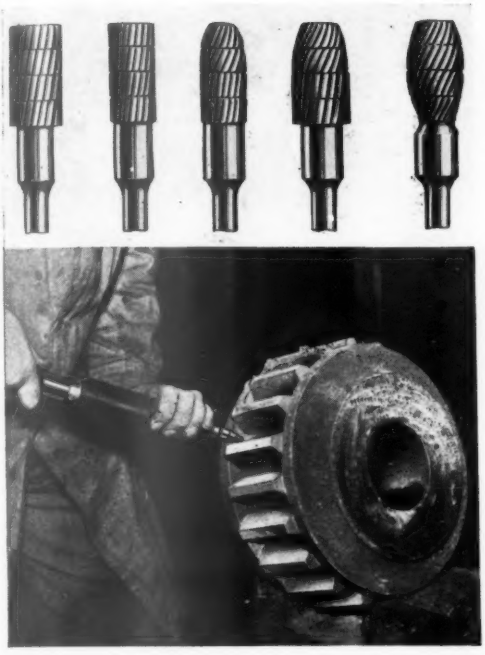


FIG. 2—(*upper*). *Typical designs of tungsten-carbide segmental burrs and* (*lower*) *trimming a manganese/molybdenum pinion casting by means of a burr tool made by Flexible Drives* (*Gilmans*), *Limited.*

Thickness Measurement

Accurate measurement of thickness on large or awkward castings has been facilitated by the application of the resonance method, using ultrasonic waves. Based on an adaptation of this principle, a new gauge has now been introduced by Dawe Instruments, Limited, 99, Uxbridge Road, London, W.5, shown in Fig. 3, which combines much closer accuracy with speedy operation and elimination of human error.

Normal ultrasonic thickness gauges depend for their accuracy on the operator: he must turn a calibrated knob to vary the frequency of the signal, and he must judge from the noise in his headphones when resonance is occurring. In the new instrument, to be known as the Dawe type 1107 "Visigauge," both these operations are carried out by the instrument itself. An electronic oscillator is frequency-modulated over a 2:1 frequency range by means of a motor-driven capacitor. The oscillator supplies ultrasonic energy to a quartz crystal which is coupled by a suitable fluid, such as thin oil or glycerine with a wetting agent, to the specimen under test. When the frequency of the oscillator passes through the resonant frequency of the material, increased power is drawn from the oscillator. This change in power is amplified and the resulting signal is employed to give a vertical deflection on a cathode-ray tube. The time base for the tube is synchronized with the operation of the motor-driven capacitor which modulates the oscillator. In this way the horizontal axis on the cathode-ray tube represents the frequency of the ultrasonic signal. Since the frequency at which resonance occurs is inversely proportional to the wall thickness, scales can readily be calibrated directly in wall thickness, either from a previous knowledge of the wave velocity in the material, or from a single test on a specimen of the same material and of accurately known thickness. In practice, however, interchangeable scales can be supplied by the manufacturers of the instrument for most of the common engineering materials.

It is claimed the gauge can be used on components of virtually any shape, since the natural frequency of vibration is essentially independent of the other physical dimensions of the material, apart from thickness. Five crystals cover wall thickness from 0.015 to 0.300 in. in steel, with a suitable overlap between ranges. The capacity in other materials is similar. By using harmonic resonance indications this range can be extended; measurements of up to 4 in. can be obtained by a simple calculation.

In reply to questions as to suitability of the instrument for (*a*) rough castings (*b*) castings having very divergent sections and (*c*) jacketed castings, the following information was supplied:—

(*a*) Surface roughness does not affect the operation of the gauge, provided a satisfactory acoustical coupling (by means of glycerine, Vaseline, etc.) is established between the crystal and the casting under test. However, since the reading for thickness obtained is an average over the area of the crystal, the uncertainty of measurement increases with increased surface roughness—the same, of course, being true with ordinary mechanical measurement.

(*b*) The gauge measures the thickness of that part of the casting which is covered by the crystal. Adjacent parts of the casting will only affect the reading when the crystal is moved over these portions.

(*c*) Both walls of jacket-type castings can be measured by applying the probe first outside, then inside. Where a wall is curved, such as a cylinder bore, a crystal of appropriate shape should be used to obtain the greatest accuracy. A potential application is for motor manufacturers who want to make sure, before machining the castings, that the cores in cylinder blocks have not shifted during pouring.

FIG. 3.—*Dawe type* 1107 "*Visigauge*" *removed from its case. At the right are the crystals for the four ranges not in use. A fifth crystal, for range* 2 (0.025 *to* 0.050 *in.*), *is plugged into the appropriate socket on the gauge.*

Institute Elects New Members

At the Council meeting held at Birmingham on October 16, the following were admitted to membership of the Institute of British Foundrymen in the grades indicated:—

AS SUBSCRIBING FIRMS

E. Backwell & Son (Pty.) Limited, Victoria, Australia. (Rep.: A. L. Backwell.)
R. Berrie & Company Limited, Glasgow. (Rep.: R. Berrie).
Sanbra (S.A.) (Pty.) Limited, Transvaal, S.A. (Rep.: K. J. Zwanziger.)

AS MEMBERS

A. L. Backwell, E. Backwell & Son (Pty.) Limited, Victoria.
R. Berrie, R. Berrie & Company Limited, Glasgow.
G. Binns, Binns & Speight, Limited, Bradford.
C. F. Boddy, Catalin Industrial Resin, Limited.
M. Boyd, B. & D. Products, Limited, Halifax.
C. E. Coates, Draffin Bros., Victoria, Australia.
H. Crowther, Baker Perkins, Limited, Peterborough.
L. Douglas, South African Railways, Pretoria, South Africa.
H. H. Draycott, Renishaw Iron Company, Limited, Sheffield.
W. H. Empsall, Barclay Empsall & Company, Limited, Bradford.
G. R. Fish, Jas. Maude & Company, Limited, Mansfield.
H. L. A. Frost, Pickersgill & Frost, Limited, Derby.
J. W. Hulme, Forth & Clyde & Sunnyside Iron Companies, Limited, Falkirk.
W. T. Morton, Renshaw Foundry, Limited, Staines, Middlesex.
E. C. Rowen, Pattern Equipment Company (Leicester), Limited.
S. P. Sen, Garden Reach Workshops, Limited, Calcutta, India.
A. J. Short, Thompsons (Castlemaine), Limited, Victoria.
J. Wetherall, Revo Brass Foundry Company, Tipton.
C. J. Wall, Metpat Company, Birmingham.
H. T. Stephens, Morgan Crucible Company, Limited, London.
H. W. Secker, Thos. W. Ward, Limited, Sheffield.

TRANSFERS FROM ASSOCIATE MEMBER TO MEMBER

T. B. Burrows, Tees-side Bridge & Engineering Works, Limited, Middlesbrough.
W. L. J. Crofts, Defence Standards Laboratories, Victoria.
E. Daybell, K. & L. Steelfounders & Engineers, Limited, Letchworth.
E. R. Dunning, Midland Electric Manufacturing Company, Limited.
A. F. Stevens, Britannia Iron & Steel Works, Limited, Bedford.

AS ASSOCIATE MEMBERS

J. K. Anderson, C. Ebeling & Sons (Pty.), Limited, Victoria.
T. G. Barker, Samuel Osborn & Company, Limited, Sheffield.
R. Barraclough, John Stirk & Sons, Limited, Halifax.
J. Bedford, Chadwick (J. N.), Limited, Bolton.
A. Bloor, International Combustion, Limited, Derby.
C. H. Bradley, A. P. V.-Paramount Company, Limited, Crawley, Sussex.
A. Choudhury, Prattsur & Company, Calcutta, India.
J. G. de Kiewiet, Climax Brass & Aluminium Foundry, Johannesburg, South Africa.
W. C. Dixon, Smith Patterson & Company, Blaydon-on-Tyne.
B. R. Douglas, John Williams & Sons (Cardiff), Limited.
J. M. Downie, Jas. Dickie & Company, Limited, Ayr.
F. Dyke, K. & L. Steelfounders & Engineers, Limited.
S. W. Embley, W. Embley, Limited, Birmingham.
F. W. Fahy, College of Aeronautics, Bletchley.
G. H. Ford, Rely Products, Limited, Johannesburg.
D. S. Gibson, Phosphor Bronze Company, Limited.
P. W. Goad, Commonwealth Scientific & Industrial Research Organization, Melbourne, Australia.
F. Gowdridge, Gimson's, Limited, Leicester.
A. Hagan, George Richards, Limited, Altrincham, Manchester.
W. Hinchliffe, Samuel Osborn & Company, Limited.
H. Howroyd, Rycroft & Company Limited, Bradford.
E. Johnson, S. Russell & Sons, Limited.
W. R. L. Lapsley, Grahamston Iron Company, Limited, Falkirk.
R. Major, Saunders Roe (Anglesey), Limited, Beaumaris.
R. E. Marks, Vale Foundry, Limited, Birmingham.
W. S. Matthews, Stanton Ironworks Company, Limited.
L. H. Medlock, Ashmore, Benson, Pease & Company, Stockton-on-Tees.
S. H. Mehra, John Harper & Company, Limited, Willenhall.
J. T. Morris, Arjay Pattern & Industrial Model Company, Hayes, Middlesex.
P. D. Norman, Foundry Services, Limited, Birmingham.
D. V. Paranjpe, Tata Iron & Steel Company, Limited, Jamshedpur, India.
C. Pogson, Kayes & Company, Huddersfield.
M. W. Reading, Leopold Lazarus, Limited, Birmingham.
A. A. Robertson, Dept. of National Development, Victoria.
E. Rushfirth, Crofts Engineers, Limited, Bradford.
G. Scott, A. P. V.-Paramount Company, Limited.
W. Sheffield, Crofts Engineers, Limited.
M. D. Singh, Coleman Wallwork Company, Limited, Oldham.
S. B. Singh, Tata Locomotive & Engineering Company, Limited, India.
J. Snodgrass, British Railways, Glasgow.
T. R. Steggles, Thos. W. Ward, Limited, Sheffield.
D. R. B. Torbet, Shanks Ironfounders, Limited, Arbroath.
H. J. Trim, A. P. V.-Paramount Company, Limited.
L. Turnbull, Smith Patterson & Company, Blaydon-on-Tyne.
C. Wade, Samuel Osborn & Company, Limited.
A. Whitmore, English Electric Company, Limited, Bradford.
R. M. Yates, Austin Motor Company, Limited, Birmingham.

TRANSFERS FROM ASSOCIATE TO ASSOCIATE MEMBER

S. C. Ghose, retired.
D. H. Goss, Ley's Malleable Castings Company, Limited.
R. T. Hinds, Stanton Ironworks Company, Limited.
F. List, John Oswald & Sons, Limited, Battersea.
A. K. Munshi, Texmaco, Limited, West Bengal, India.
K. Rosen, Vulcan Foundries, Limited, Haifa.
W. P. Winterton, Bamfords, Limited, Uttoxeter.

AS ASSOCIATES (over 21)

G. A. Bushell, Morris Motors, Wellingborough.
S. S. Chawla, Ordnance Factory, Meerut, India.
M. H. Griffiths, Sterling Metals, Limited, Coventry.
W. A. K. Lester, National Foundry College, Wolverhampton.
A. Roper, Sterling Metals, Limited, Coventry.
D. C. Roy, Indian Iron & Steel Company, Bengal, India.
W. J. Ryan, John I. Thornycroft, Limited, Southampton.

AS ASSOCIATES (under 21)

T. E. Birch, Guest, Keen & Nettlefolds, Limited, Smethwick.
K. O. Deutscher, Caulfield Technical School, Victoria.
C. G. Evans, Caulfield Technical School.
J. A. Hall, Holroyd & Hall, Limited, Bradford.
S. A. Hand, Castings, Limited, Walsall.
K. W. Hopes, Newman Hender & Company, Limited, Woodchester, Glos.
G. Lyon, Dobson & Barlow, Limited, Bolton.
R. Porter, T. H. & J. Daniels, Limited, Stroud.
K. W. Webster, Caulfield Technical School.

Censuses to be continued

The report of the committee on the Censuses of Production and Distribution has now been published as a White Paper (Cmd. 9276).* One of the committee's main conclusions is that the censuses of production and distribution serve a useful purpose and should be continued. They recommend that a full census of production should be taken for 1957 and for 1961, with sample censuses or surveys of production in between, and that a sample survey of distribution and other services should be taken for 1956, the next main census of distribution to be planned for 1960. The committee also make a number of specific recommendations designed to reduce the burden on the business community whilst improving the effectiveness of the censuses. With these simplifications in procedure and the recent integration of the two census offices into one combined office, the committee estimate that the programme of censuses can be carried out with a total staff of about one half of that employed in 1951, when the first census of distribution as well as the annual census of production was being taken.

* Copies may be obtained from H.M. Stationary Office, Kingsway, London, W.C.2, and branches (price 1s. 6d., by post 1s. 7½d.).

Useful Wall Chart

Foundry Services, Limited, of Long Acre, Nechells, Birmingham, have produced a very fine wall chart showing the construction and operation of a cupola illustrated by the country's best foundry artist. There is only danger—everything seems so beautifully clear, that it may be forgotten that experience still counts. It is an excellent effort and is available to readers on application to the Long Acre address.

Metallic-arc Welding of Spheroidal-graphite Cast Iron*

Discussion of the Paper by F. A. Ball, B.Sc., A.C.T. (B'ham) and D. R. Thorneycroft, B.Sc., A.C.T. (B'ham), A.I.M.

Initially, there was some doubt expressed as to whether the Authors had chosen the best approach in seeking to weld spheroidal-graphite iron castings with filler rods of dissimilar metals. However, it was pointed out that dissimilar metal junctions need not be a disadvantage, especially for composite assemblies. Next, the possibility of hard zones across the joints—where transition alloys would be expected—was raised. Finally, a written contribution concerning closely parallel work was presented, and the Authors commented on this, outlining their conceptions of preheating, stress-relief and heat-treatment.

DR. R. V. RILEY, who opened the discussion, said the work carried out appeared to be very thorough and extensive, but he could not help feeling that from the user's point of view, and even the manufacturer's point of view, the conclusion was going to be that the welding of spheroidal graphite iron was extremely difficult. From his own experience he thought it an unjustifiable conclusion. He could not help thinking that the Authors had made very heavy weather of the project, because he felt that in striving to develop an electric-arc technique they had probably missed the easier method of gas welding the material.

The points in the Paper which impressed him were that unless the welded work was very fully annealed afterwards it was difficult to machine it. That of course, was a pity from the user's point of view. Furthermore, from the manufacturer's angle, the repairing of large castings would thus appear an almost impossible operation as it would hardly be profitable to envisage such annealing. He thought one wanted a weld which could be made without any further heat-treatment after welding.

Really a Brazing Operation

It was noteworthy that the tensile strength given in Table I of the welded joint, appeared to be less than the plate in all cases. Furthermore, the impact strength of the joint did not appear to approach that of the plates.

The most important criticism he had to raise was that this was not really welding at all: it was a form of brazing! Therefore the joint was going to be very liable to electrolytic corrosion troubles. The Authors had been depositing a more "noble" metal and therefore he would expect corrosion of the cast-iron areas around the joint. He thought that any form of weld with spheroidal graphite cast iron should be made with a weld material that reproduced more nearly the composition and structure of the base metal.

Finally, he would enquire why half-inch plates and one-inch plates were chosen when one important application of a welded spheroidal graphite iron to-day was for a very thin casting.

* Paper printed in the JOURNAL, October 28 and November 4.

Composite Assemblies Envisaged

MR. BALL, in reply to the points raised, said although Dr. Riley felt that the use of metallic-arc welding was probably not a successful way of undertaking the welding of graphitic cast iron, their experience on the welding of materials other than spheroidal graphite cast iron had indicated that the metallic-arc process was advantageous when dealing with fairly large castings. The methods of welding which made use of the oxy-acetylene torch called for a fair degree of pre-heating and they were hoping by the use of the metallic-arc process to avoid the need for any pre-heating. They had not achieved that with pearlitic material, but they were successful with ferritic material. Despite Dr. Riley's comments, they did feel that the metallic-arc process was very applicable to castings of considerable dimensions. It was also a satisfactory method for the incorporation of spheroidal-graphite-iron castings into structures which included mild steel, and they hoped to see the use of s.-g. iron in such multiple structures.

Concerning machinability, it was realized that the joints, in the as-welded condition made by the metallic-arc method did lack machinability in the area of the joints, but in many instances this lack of machinability was not a matter of importance. It was not necessary in all instances that the welded joint should be completely machinable. In the instances where a casting was being reclaimed, the full heat-treatment given to put the iron in the fully ferritic condition could be applied after the welding, and would fully soften the welds as well as ferritize the casting. The heat-treatment would be applied in any case to the casting, so that the welding did not necessitate additional heat-treatment.

Corrosion Aspects

The subject of corrosion was being studied in detail, with a number of corrosion tests being carried out in the laboratory. The heterogeneity of the welded area through the presence of a more "noble" metal, and hence a possible increase in local corrosion, was one on which he could not at the moment comment in detail. It would, however, only be of significance in acid solutions. Once

Metallic-arc Welding of Spheroidal-graphite Cast Iron—Discussion

again there were many applications where the corrosion resistance of the s.-g. iron was not in question. For such applications, the heterogeneity of the welded joint was of no consequence.

As to the use of plates half-inch and one-inch thick, the Authors were anxious to make accurate determinations of the mechanical properties of welded joints and this was more satisfactorily carried out on material of these thicknesses than on thinner plates. The stress and thermal conditions in thin material would be less severe than in the test-plates used, so that the welding of thin material should be easier and the mechanical properties of the joints at least as good as those obtained on the thicker material.

MR. A. R. PARKES said in most cases he found himself in sympathy with Dr. Riley's point of view. From a metallurgical point of view he could not quite see why, first of all, the lecturers did not try using a welding rod more closely allied to the base material. For instance, had a nodular cast-iron rod with sufficient compensating ingredients, been tried as an electrode for metallic-arc welding?

Referring to another point; with the use of the high-nickel alloy rod, however much such a material was annealed, the structural system across the joint would still contain somewhere a transition alloy of nickel/iron and one would expect a Ni-Hard type of structure somewhere. He would like to know if that was the case.

Scope for Further Work

MR. BALL, in reply, said that the experiment of using electrodes having a composition similar to that of the base material had been tried, but not in this country. It was possible that in time such electrodes would be developed. They were at the moment exploring the question of welding cast iron by many different methods. They had used a nickel/iron electrode and an aluminium-bronze electrode because those two materials were available in this country. One or two investigators had tried developing a cast-iron electrode, and appeared to be getting some success, but the weld metal deposited with this type of electrode had a marked tendency to crack on deposition. That tendency could only be noticeably reduced by preheating to temperatures of the order of 500 deg. C.

He thought members would appreciate that the Authors had tried to avoid pre-heating altogether. They had been successful with ferritic iron, and even with restrained joints in pearlitic iron, it had only been necessary to pre-heat to 200 deg. C. to obtain crack-free joints. Thus the use of a cast-iron electrode had the considerable disadvantage in their opinion of requiring a high pre-heating temperature.

Transition Zones

The other point which Mr. Parkes had mentioned was that of the transition zones. It was agreed that there was a marked change in composition on passing from the cast iron to the nickel/iron weld metal. The weld metal had been found to contain, in the root runs, a nickel content of about 40 per cent., due to dilution of the nickel/iron from the electrode by the cast iron melted during the welding process. Theoretically, it might be argued that somewhere between the base iron and the weld deposit there should be an alloyed cast iron of such composition that it was air-hardening. The presence of such a layer was not detected microscopically, although its presence would, of course, be masked by the hard zones formed in the base iron as the result of the welding. Adjacent to the weld metal, the structure of which could be described as graphitic austenite, was the zone of eutectiferous cementite and then one of the transformation products, martensite and bainite, with no clear lines of demarcation between them. The tempering characteristics of an alloyed iron such as that suggested by Mr. Parkes would be different from that of the hardened s.-g. iron, but no zone having tempering characteristics consistent with a highly alloyed iron was found by hardness explorations on tempered sections.

Figs. 7 (a) and (b) in the Paper showed the hardness curves obtained on sections from the joints in the as-welded condition. The various heat-treatments applied to these joints had resulted in varying degrees of softening, as detailed in the Paper, the full ferritizing treatment giving complete softening.

MR. PARKES said he imagined only a line zone of hardness at the transition zone which might be masked by a Brinell hardness test.

MR. THORNEYCROFT replied that all the hardness determinations were carried out on a Vickers machine using a 10 kilogramme load with a diamond indentor and the impressions were as closely spaced as possible consistent with accurate determinations. He thought the two figures 7 (a) and (b) illustrated that point. There was a build-up in hardness in the heat-affected cast iron to the weld junction, but as soon as the join between the cast iron and the nickel/iron weld metal was crossed there was a sharp drop in hardness. With the aluminium-bronze deposit there was a shelf of hardness in the weld metal itself, this weld metal being harder than the heat-affected zones in the cast iron.

WRITTEN COMMENT

MR. MACKINTOSH at the meeting explained that he was there to read written comments as follows, from Mr. J. W. Shedden and Dr. W. I. Pumphrey (of Murex Welding Processes, Limited), who had intended to be present but had been unavoidably detained:—

MR. SHEDDEN and DR. PUMPHREY wrote that the results obtained by the Authors with the nickel/iron type of electrode for welding s.-g. cast iron confirmed, in a general way, their experiences with the "Cinnifex" electrode with this type of parent metal and a brief reference to the use of this electrode with ordinary grey iron and s.-g. iron had been published in the technical Press. Their recommendations for welding s.-g. cast iron were, perhaps, a little more

specific than those suggested by the Authors. They considered that if the welded joint was to possess good strength and reasonable ductility, careful attention to details of welding technique was essential. The parent metal should be in the fully annealed or ferritic condition, as stated by the Authors, and in addition it was only after annealing that s.-g. iron exhibited the elongation and impact properties necessary in the majority of fabricated structures.

They recommended that the fully-annealed s.-g. iron should be well preheated before welding, the smallest possible gauge of electrode should be used at the minimum welding current and that the finished weld should be tempered or stress-relieved at approximately 620 deg. C. A consideration of the metallurgical factors involved would amplify the reasons for the adoption of these recommendations. For the production of a satisfactory welded joint, some of the parent metal must, of necessity, be melted and on solidification this remelted material produced the pools of eutectic cementite shown in Fig. 10 of the Paper. This constituent was extremely hard and it was considered that the welding technique should be controlled so that as little as possible of this type of structure was produced.

Recommended Procedure

With preheating it was possible to deposit weld metal at reduced welding currents and then they would normally recommend current values of 100/105 and 75 amps for the electrode in the 8 gauge and 10 gauge sizes respectively. These values were less than those mentioned on page 2 of the preprint of the Paper. The use of reduced welding currents minimized the amount of parent metal melted during welding and the Authors might have obtained improved results if preheating had been adopted in their experiments. The adoption of a "buttering" technique might also be advantageous in this connection. With this technique the edges of a vee preparation were first surfaced with a layer of weld metal deposited with a 10-gauge electrode and the joint itself was then made with an 8- or 6-gauge electrode.

The judicious application of a preheating treatment would also help in reducing the amount of martensite formed in the heat-affected zone. The production of this type of constituent was controlled by the rate of cooling of the welded piece, and it was advisable, therefore, that the chilling effect of the large mass of the parent metal should be reduced as much as possible. It might not be possible to avoid, completely, the formation of a martensitic zone, however, and in such an event the application of a subsequent tempering treatment at 600 to 650 deg. C. was desirable. The effect of tempering a martensitic heat-affected zone was clearly shown in Figs. 12 and 13 of the Paper. The results in Table VI showed that the application of a tempering treatment had not affected appreciably the hardness figures on the welded joints, although the results in Table VI are not wholly in agreement with the marked improvement in machinability observed by the Authors after stress-relieving at 550 deg. C. The breakdown of the martensitic type of structure appeared to be highly desirable but any advantage in increasing the tempering temperature above 650 deg. C. was, perhaps, open to question.

Tempering at 600 to 650 deg. C. would not affect the eutectic cementite and it was, therefore, desirable to limit the amount of this constituent formed during deposition, as already stated. The Authors had shown that with higher tempering temperatures the eutectic cementite could be decomposed to graphite in spheroidal form with a reduction in the hardness of the heat-affected zone and a consequent improvement in machinability. Unfortunately, however, as indicated in Table II, there was no resulting improvement in the tensile properties of the welded joints with the higher tempering temperatures and fracture of the tensile specimens still occurred at the weld junction. The writers would be interested to know whether this was perhaps due to the graphite being deposited in an intercrystalline manner in a coarsened structure of the type shown in Figs. 14 and 15.

Results with Bronze Electrodes

The results obtained by the Authors when using aluminium-bronze electrodes were of interest and illustrated the disadvantage of using copper-base alloys for the welding of cast iron. Apart from the production of the brittle intermetallic phase in the weld metal, however, there were other considerations which were sometimes overlooked in this connection. Any advantage which might be associated with the lower melting point of the copper-base alloys appeared to be more than counter-balanced by the higher thermal conductivity and lower specific heat values of these alloys compared with those of the nickel/iron alloys. These factors gave rise to an increased depth of heat-affected zone as was shown in Fig. 26. The structure shown in Fig. 24 was unusual and the more-normal structure in Fig. 26 (× 100) can be compared with that in Fig. 10 (× 300) to illustrate the thermal disturbances associated with the two types of electrode. The thermal expansion effects with each type of weld deposit were shown by the Authors in Fig. 28. These findings emphasized the advisability of using the nickel/iron type of electrode for welding s.-g. cast iron and the results recorded in the Paper lent encouragement to the view that with the employment of the necessary welding technique and further experience with the metallic-arc welding of s.-g. cast iron increasing use will be made of welding in the assembly of large and complicated units in s.-g. iron from a smaller number of simpler pieces.

THE AUTHORS, replying, thanked Mr. Mackintosh for the detailed contribution. Mr. Sheddon and Dr. Pumphrey had made the recommendation that s.-g. cast iron should be welded in the ferritic condition; whilst in general they agreed with this view, they had deliberately planned the investigation to cover the welding of both ferritic and pearlitic iron, since they felt that there must be many instances when a casting was required to be welded in the pearlitic condition, where it would ultimately be

required in that condition. Thus tests had included material in the pearlitic as well as the ferritic condition. It was agreed that as a result of the welding there was a local deterioration in machinability, but this was less marked with ferritic than pearlitic material.

There was also the case that, if one was carrying out the reclamation of a casting, it was much better to do this in the pearlitic condition than the ferritic condition, since if the casting was ultimately required in the ferritic condition the ferritizing treatment could be carried out subsequent to welding and would both ferritize and fully soften the weld zones.

Regarding pre-heating, it was felt that one of the big advantages of the metallic-arc process was that it called for little or no pre-heating prior to welding. There were many instances where a casting could be welded without any form of pre-heating whatever, which was a big practical advantage. So, while they agreed with the contributors that if one wanted the maximum machinability one should use some degree of pre-heating, there were many instances when it would be better to weld the casting at room temperature and carry out any heat-treatment necessary afterwards.

Supplementary Techniques

In the contribution read by Mr. Mackintosh, the words "stress relief" and "stress relieving at 650 deg. C." had been used as separate items. It was assumed that both meant a heat-treatment at 650 deg. C. Any tempering treatment which did not exceed 650 deg. C. would break down the martensite but would have little effect on the carbide present: while it would bring about an improvement in machinability, the original machinability could only be restored by a full ferritizing heat-treatment after welding.

Mention had been made of the "buttering" technique as a means of avoiding the formation of a large heat-affected zone. If a thin layer of nickel/iron weld metal was deposited on to the surfaces of a joint in s.-g. cast iron, a hardened zone was formed in the cast iron. Whilst this could be narrower than the zone resulting from the normal method of welding it would nevertheless noticeably reduce the machinability. Unless machinability was important and the welded casting was not to be heat-treated, the Authors felt the very much quicker "steel" method of welding was to be preferred to the rather more difficult method of "buttering" the weld prior to completing the joint. They had hoped to reduce hardening in the cast iron by using the aluminium-bronze electrode. By using a weld metal with a lower thermal capacity and so lowering the heat input to the cast iron it had been hoped to reduce or even prevent the formation of the hard zone in the cast iron. These trials had not been successful; indeed, the welds were even less machinable, because of the hard weld metal.

Going back to a comment by Dr. Riley, earlier, when he said that the use of a nickel/iron electrode could not be called welding of cast iron, but should be referred to as brazing. Welding was a most difficult process to define exactly. Even when fusion welding ordinary flake-graphite cast iron the filler-metal composition was different from that of the cast-iron base. The melting and solidification characteristics had to be modified by additions of silicon and manganese. How far the composition of the added metal could depart from that of the base material before the joining process could no longer be called welding would be impossible to define. The Authors felt that any process which involved the full fusion of the base material should be termed welding and any process, such as bronze welding, which did not involve melting of the base material should be called brazing.

Vote of Thanks

THE PRESIDENT, closing the meeting, said pioneers always had a difficult job and Mr. Ball and Dr. Thorneycroft had been doing a job of pioneering. Undoubtedly it was a specialized subject and they were learning as they went along. However, members always welcomed pioneers, fully respecting the men who did things that no one had tried before. He thanked the Authors for coming along to tell members of their researches, and hoped that the discussion might have helped them with their future work.

DR. THORNEYCROFT, speaking also for his colleague, briefly thanked the members for their interest and the comments which had been made.

Wages Award Date Disputed

A disagreement between the Alloy Steel & Iron Company, of Carbrook Street Foundry, Sheffield, and the Amalgamated Union of Foundry Workers, concerning the observance by the company of the terms of an agreement in the engineering industry has been the subject of an Industrial Disputes Tribunal which issued its report last month.

The Union considered that the company should have implemented the agreement which provided for wage increases from the operative date, April 5, 1954, or at least from April 20. They maintained that it was brought to the company's attention by a shop steward on April 20. The company submitted that the terms of the agreement were not brought to their attention and a claim made until the visit of the local union officer on May 10. The increases had been paid since August 19, and the firm was prepared to pay them from June 10, when representatives of the company and union met.

The tribunal found that May 10 was the date when the issue first arose. They awarded that the company should observe the recognized terms and conditions of employment from that date.

CASTINGS formerly taken from the Strand Foundry, Monkwearmouth, of J. Wilson & Company, to be machined at Millfield, Sunderland, will, under the company's reorganization scheme, be machined in future at the Monkwearmouth works.

Simple Foundry Expedients Proved Worthwhile in Recent Years*

Discussion of the Paper by J. E. O. Little

The discussion showed members were generally appreciative of this sort of practical paper and comment concerned points of detail only. These included the use of rubber tyres in rumbling barrels, types of chill for roller production, the cupola tip-up spout and special loam for moulding. Additional hints were quoted, giving recommended practices for preparing cupola tap-holes and slag-holes and pouring-basin formation on moulding machines by means of a pattern carrying a permanent magnet.

The first Paper at session "E" of the annual conference of the Institute of British Foundrymen in Glasgow, with the president, Mr. John Bell, in the chair, was by Mr. J. E. O. Little and dealt with "Simple Foundry Expedients proved Worthwhile in Recent Years."

Opening the discussion, MR. PARRY referred to the last item mentioned in the Paper—the tumbling barrel—and said the illustration showed the lining of the barrel, but he wondered how it was fitted. Did Mr. Little take old motor-car tyres and cut them to fit the shape of the barrel, or had the tyre to be flattened, so that it would take the reverse shape? He would be glad if Mr. Little could give details.

As to the rubber-edged blade for the mill, he would like to pay tribute to whoever suggested that idea; he had been able to use it in his own plant very successfully indeed.

Another point was Mr. Little's comment that ideas in foundries did not always get as well known as they deserved; could he recommend a suggestion that had been received in the East Anglian section of the Institute. It was intended to include in the forthcoming programme a "Gadget Night," when every member would bring along a novel, or original idea so all could get benefit from the other fellow's "brainwave."

Rubber for Wear Resisting

MR. LITTLE, dealing with the fixing of the tyre in the tumbling barrel, said they always tried to use tyres with some of the tread remaining. Once a tyre was worn to the canvas, it soon disintegrated, but if there was any rubber it stood up very well. The rubber was fixed with bolts in the grooves between adjacent tyres. The tyres stood up splendidly and gave continuous service. One set must have been installed over three years ago and he had only once heard of their having being renewed. He thought founders did not really appreciate the value of rubber for standing up to abrasive wear. For instance, with impeller boxes of sand-ramming machines and the shot used for blasting castings, the material bounced off the rubber, resulting in the necessity for replacement only about every three months. This was a far-and-away better result than with steel, from the point of view of wear.

As to the rubber on the bottom edge of the sand-mill scraper, he had an idea there that there was a variation in the quality of the rubber and believed there was quite a difference in the nature of the sand in relation to the wear of the rubber.

Chilled Rollers

MR. JACKSON asked about the moulds for the chilled rollers; he had noticed they were made in varying diameters and wondered if any definite relationship had been found between diameter of the roll required and the thickness of the chill, bearing in mind that a machinable casting had to be produced, and the chill had to be the correct thickness for that purpose. Was there any trouble with the moulds fracturing? He noticed split moulds were used, was there any special advantage in this? Had Mr. Little any record of the life of the chills, and what was the dressing used on them?

MR. LITTLE said the rollers ranged from six to 10-in. dia., and the depth of the mould was up to about 9 in. Mould thickness had been standardized, at he thought, 1¼ in. With that thickness, when the mould was cold, there was a tendency to get chilled edges at the bottom of the mould. In the morning, when the chill was cold, a copper addition was made in the ladle. Once the mould was warm, they could continue casting all day and they had never had a broken or cracked mould.

The reason for having split moulds was that if a piecework labourer was too enthusiastic he was apt to cast into the chills a little too quickly and, if the metal was too hot, there was an occasional "burn-on." It was found that with the split mould it was easier to strip the castings. The "life" of the mould usually ended with a "burn-on," which could not be removed. The dressing used was a plain blacking wash. He had tried, probably in ignorance, using tarry dressings and so forth, but those were detrimental because they immediately resulted in "blown" castings. It was essential to keep the chills dry. Using black wash, blown castings never occurred.

Additional Hints

A MEMBER contributed three additional notions to the Paper. Two were concerned with cupola tapping holes and slag holes. All must be familiar with the hollow refractory pipes used for the bottom-pouring of steel moulds—such sleeves of

* Paper printed in the JOURNAL, July 22 and 29.

Simple Foundry Expedients Proved Worthwhile in Recent Years—Discussion

various sizes, cut down if necessary, could be used for making-up tapping or slag holes.

Another idea for a tapping hole was one he had used for many years. One made a simple cast-iron tube of dimensions appropriate to its use, and used this as a mould for producing a tapping block of rammed refractory—carrying a reinforcing grid—with a hole of desired size.

One could stock a number of such prepared blocks ready for plugging in to the furnace when required.

The third hint was in connection with moulding-machine practice, and the production of the pouring basins in the top-part box. As different pattern-plates had to be positioned in different places, it was decided to line the pressure-head of the machine with a piece of sheet steel and to make pouring-basin patterns of aluminium and insert an "Alni" permanent magnet in the top. By so doing, one could exactly position the basin on the pressure head just where required, and it was no longer necessary to cut out the cavity with a trowel.

MR. LITTLE thought the idea of a tap-hole with refractory sleeves was very sound. Tapping holes in general, and particularly with a basic cupola, could provide trouble. In his cupola he preferred to use a piece of chrome brick for the tap-hole. That was neutral and free from any chemical erosion. As far as slag-holes were concerned, they also could be made with chrome brick. Once a clean piece of chrome brick was built in, it could be operated with for a week without ruining it.

The idea described in the Paper is a means to get a man out of trouble when he had made a mess of the furnace tap-hole at the beginning of a "blow." The magnetic pouring-basin pattern was quite a sound idea, just the sort of thing of use to a founder who might be wanting to shift the pouring basin, and having difficulty in positioning it.

Tip-up Spout

MR. H. HAYNES, referring to the hinged spout, said he supposed it was intended to serve as a reservoir. He thought it a good notion and would like to know the amount of metal it would hold before tipping it into a ladle. Also, was there any trouble with metal getting into the hinge and stopping the gadget working. He was very pleased with the idea shown in Fig. 20 of the Paper, of the chipping stool which had a guard round it. This was for the good reason that though the men in the workshop were provided with goggles they did not wear them. Additionally, he asked Mr. Little how he mixed his ganister and what material he used to reduce the shrinking of loam before it was dry.

MR. LITTLE said the tilting spout had one end wider than the other and it was calculated that it would hold 10 cwt., although that might vary a little from day to day. There had never been trouble with the hinge sticking; it was sufficiently far back to be out of harm's way.

With regard to the guards on the stools, there was a further point worth noting. Quite a few of the men using them had to put sheets of cardboard on the wire-mesh guards. This mesh was roughly ¼ in. and the bulk of the chips went into it and were stopped by it, but it had been found there was a tendency for the smaller-size chips to go through and hence use of cardboard coverings over the guards. Apart from that, the stools had proved a sound idea.

Special Loam

He did not know if Mr. Haynes had seen the West of Scotland type of loam, but it varied greatly, he believed, from foundry to foundry. Scottish founders did not do as was done in England, just wet-down the floor sand. The loam they used was a local one; the river which ran through the works went down the Irvine valley, in which there was a clay in the soil which had a very high iron-oxide content.

When they prepared loam for moulding they obtained gravel, including stones from two to three inches diameter, from a place up the river from the works. The gravel and stones were crushed in a pan mill to a point where it was just possible to feel chips in it. When the stones were crushed, clay was liberated which had been deposited when the stones were formed and actually the resultant loam had about 20 per cent. clay. It acted in a similar manner to concrete. They had the little stone chips as aggregate and instead of cement they had the clay.

Near their foundry, there was a works where the same clay was being used to make soil pipes. The kilns did not go above about 800 deg. C. yet that was enough to set the clay and fuse it slightly. Some years ago, he had tested the fusion point of this material and in a reducing atmosphere it actually began to go plastic at 650 deg. C. so it could be appreciated there was a limit to the use to which it could be put. Becoming plastic at so low a temperature, the loam containing it had a very high hot-strength and as long as too-thick a metal section was not cast in contact with it, it was perfectly safe and sound as a mould material. If the section went to, say, 8-in. thick, however, then the clay began to fuse and the casting instead of keeping smooth showed a wrinkled surface due to surface distortion of the mould at the high temperature.

The PRESIDENT, closing the discussion, said he thought the best way of thanking Mr. Little was for all founders so to work their foundries that they had ideas of their own to pass on. He was sure members were very grateful to Mr. Little for his most interesting Paper.

A NOVEL EXPERIMENT was carried out at the Clydesdale Works, Mossend, of Stewarts and Lloyds, Limited, recently, when 100 men worked by floodlight in an effort to speed up completion of a steel-making furnace. In addition to the nightshift, there is also a dayshift working. When in full production it is hoped the furnace will yield almost 1,000 tons of steel more per week. There are already four furnaces at the works.

Production of Castings for Woodworking Machinery*

By R. Higgins.

The firm with which the Author is associated has been among the foremost and largest manufacturers of woodworking machinery for over a century. Scores of various types of machines, covering almost every phase of woodcutting, are produced to satisfy the requirements of customers. These machines range from the planer and bandsaw commonly seen in all patternshops, to the large horizontal log band mill, which is used for breaking down logs up to 7 ft. dia., and any length, at a speed of up to 70 ft. per min. The speeds at which these machines perform their respective duties, and the stresses which are transmitted to the various parts, necessitate a high quality of casting, and a very keen inspection of all finished parts. Associated with this is the important factor of the weight of certain machines which automatically affects price. Castings are therefore required with the minimum thickness of metal.

Owing to the weight and sectional thickness requirements, woodworking-machinery castings are a very interesting type of casting to produce, and the complicated design and thin section, combined with the inclusion of large bosses and slides, also make them difficult castings to produce successfully without porosity or internal shrinkage. Thirty or forty years ago, machines were designed with only a minimum thought to the safety of the operator, and cutting speeds were below those of modern machines. The present technique of designing strives to eradicate all sharp corners and dust-collecting crevices by introducing streamlined shapes, and also by incorporating starter- and fuse-boxes inside the main casting, thus reducing labour costs in the fitting and assembling department. All this increases the difficulties of the foundry, which is striving to produce these castings at an economic figure.

In a recent interview, a well-known Canadian industrialist, Mr. George Drew, stated that although there is a tremendous market for British goods in Canada, and Canadians are buying large quantities now, the sales are not even approaching what they should be, because the appearance or " eye-appeal " of the British finished article is not up to the standard being produced by competing countries. Therefore, British designers are constantly attempting to overcome this competition by re-fashioning present machines, and at the same time introducing new models.

These points have been mentioned in order that it may be appreciated that full mechanization would not be beneficial or economical in a foundry producing such castings, the patterns which may be altered or found to be obsolete at any moment. Therefore, this has had an effect upon the lay-out of the foundry plant. The foundry consists of two bays, 350 ft. long by 40 ft. wide, the floor area being 28,000 sq. ft.

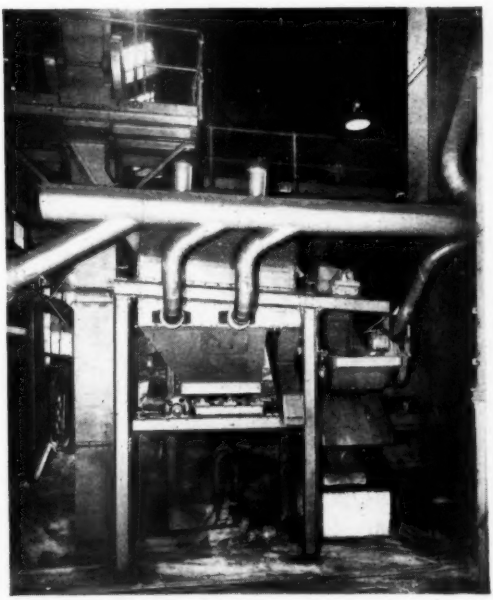
Moulding Plant

Moulding machines have been installed in the foundry with a view to speeding-up production, reducing hard work, overcoming skilled-labour difficulties, and also obtaining better finish, and castings which are more accurate dimensionally. There are four machines of different capacities, ranging from a small pin-lift machine to the 4,000-lb. roll-over machine. Included in this range are a 750-lb. and a 1,500-lb. Pneulec jolt-roll-over, and the management is striving to mount on plates *all* the patterns, 90 per cent. of which are already plated and in production; moulds from these are rammed-up by semi-skilled labour.

Sand Preparation and Distribution

A large unit-type sand plant, consisting of

FIG. 1.—*Rear of sand plant showing the disintegrator and dust extractor.*



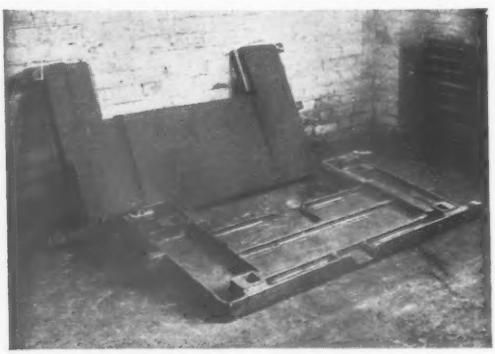
* Paper read before the Burnley section of the Lancashire branch of the Institute of British Foundrymen.

FIG. 2.—*Sandslinger moulding unit, mould drier (left) and shake-out (right).*

magnetic separators, disintegrator, storage hoppers and two 6-cwt. capacity mills, is capable of preparing and re-conditioning 8 tons of sand per hr. to any specification. A large underground belt runs the full length of the foundry, and returns the used sand to the plant. A mobile Sandslinger traversing half the length of the foundry, and a stationary model, are both fed with unit sand from the plant. Fig. 1 shows the rear of the sand plant, showing the disintegrator and dust extractor.

The major proportion of sand prepared is a synthetic mixture comprising of returned sand, Chelford silica sand, coal-dust and bentonite. A constant check is taken approximately every ½ hr. for permeability, moisture, and green-compression strength. Owing to the speed with which this sand "air-dries," however, it is unsuitable for certain classes of moulds, namely, moulds which are open to the atmosphere for two to three hours. Special mixtures are therefore put through the plant, and instead of the addition of Chelford silica sand, and bentonite, a natural sand is added, approximately 10 per cent., and the percentage of coal-dust is increased. Except for isolated cases, the foundry specializes in green-sand moulding.

FIG. 3.—*Saw-bench tables of relatively thin section, produced on the plant shown in Fig.* 2.



The properties of the synthetic mix of sand are:—Permeability: A.F.S. Nos. 75 to 80: moisture, 4.5 to 4.8 per cent.; green-compression, 6.5 to 6.8 lb. per sq. in. and dry-compression variable between 60 and 80 lb. per sq. in. The sieve test on washed sand shows that 50 per cent. by weight of sand remains on B.S. sieve mesh No. 100, 20 per cent. on mesh No. 72, and 10 per cent. on mesh No. 120.

Attempts have been made by adding various natural sands to the above, in order to produce a sand to suit the larger type of moulding jobs, and still give an exceptionally smooth-finished casting free from scabbing.

Hensall sand gave very satisfactory results, but is of a rather coarse nature, and although the permeability was high, the finish was not up to standard required, therefore the foundry is now using an addition of 5 per cent. Mansfield and 5 per cent. Chelford, and the results so far have been satisfactory, large castings being produced in green-sand with a very smooth skin. One must bear in mind that, although these castings are fairly large, they are of very thin section.

Moulding Unit

A moulding unit is fed directly with sand from the plant, the sand being ploughed off the distributor belt down a chute to a continuous belt which feeds a bucket elevator, which in its turn supplies the sand to the Sandslinger and impeller head, at a regulated rate of flow. When the operator starts the Sandslinger, it is automatically controlled so that the head is the first to start and the last to stop, thus overcoming any building-up of sand.

Machined aluminium master plates are used, with pins set in to suit holes in the moulding boxes, also to locate the wooden pattern boards, on which the pattern is correctly located for matching up. The pin centres are the principal setting points for all pattern boards. The pattern boards are fastened to the master plate by means of six $\frac{1}{2}$-in. bolts and the box part is lowered into position. They are all brought within range of the impeller head by the use of movable conveyor tracks. Sand is first of all riddled or sieved on to the face of the pattern and the box is then rammed up by the Sandslinger and the top is flat-rammed and strickled-off. The pattern board, master plate, and rammed mould are pushed on to a roll-over-and-draw machine, on which two automatic clamps grip the underside of the master plate, and two more grip specially-set lugs on the ends of the moulding boxes. The roll-over action takes place, the draw-table rises and holds the moulding box and pattern board under compression, the box clamps are released, the mould is drawn and the table returns to its former position.

A mould dryer is incorporated in this unit, and moulds which require a great deal of coring-up are faced with a thin layer of oil-sand or pitch-sand, and skin dried. This operation of skin-drying takes approximately 15 to 25 min., depending upon the depth, at the end of which time a mould is obtained with a very hard surface. Fig. 2 shows this moulding unit and the shake-out machine.

Low maintenance costs are attributed to the fact that it is solely a roll-over-and-draw machine, and no jolting action takes place, also because of the fact that the moulding boxes are filled with the Sandslinger at a position remote from the machine, and no sand penetrates into the roll-over bearings, and the draw cylinder. About 50 per cent. of the castings required for the firm's woodworking machinery are produced on this plant.

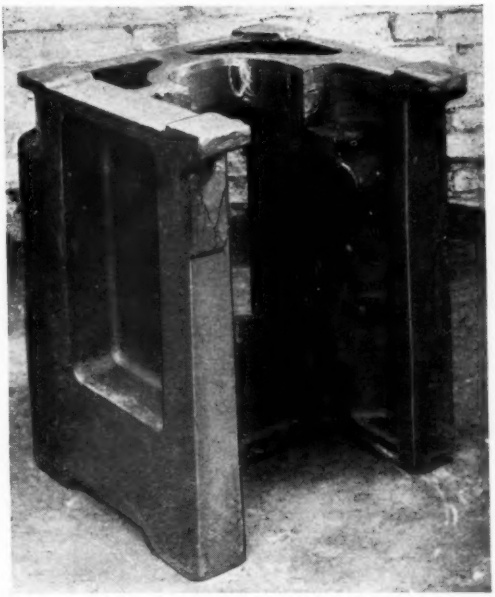


FIG. 4.—*Pillar casting also made on the Sandslinger/roll-over machine set-up.*

Typical Production

Four men, including one skilled moulder, two semi-skilled men, and a labourer operate this unit and keep up an average production of 18 moulds

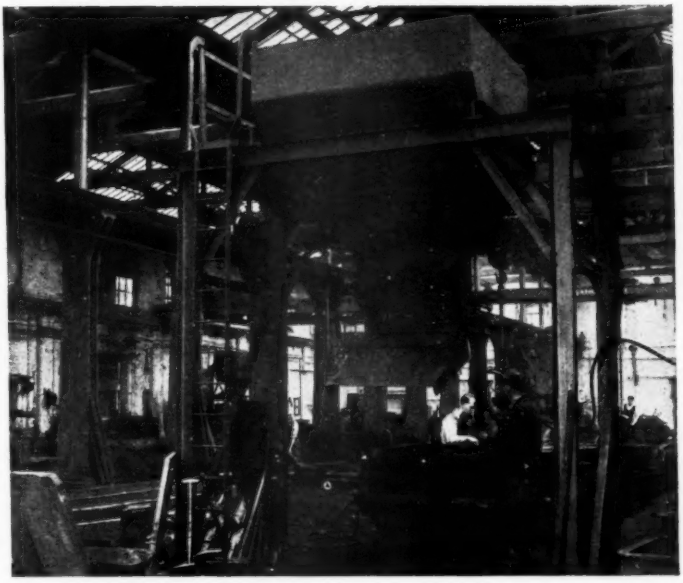


FIG. 5.—*Rear view of the Pneulec jolt-squeeze/roll-over/draw machine and the sand hopper which serves it.*

FIG. 6.—*Mould for a headstock casting, made on the* 1,500-*lb. machine.*

per day in steel boxes, the sizes of which are 4 ft. 6 in. by 3 ft. 6 in., and 6 ft. by 4 ft. 6 in., with depths varying from 18 in. to 30 in. The speed at which patterns can be changed by unscrewing and lifting off the metal plates is extremely important when one considers that up to six different patterns are in use in one day. This factor further stresses the amount of variation one encounters in the foundry.

Fig. 3 shows two saw-bench tables produced on this machine, and cast in a special high-silicon iron, in order that internal stresses will be negligible. These tables are cast with the machine face down; a runner the full length of the casting is split in the centre, and carries four ingates on each runner file. The mould is thus filled evenly and quickly. These tables are only $\frac{3}{8}$-in. thick and are ribbed for strength. They are planed at a cutting speed of 120 ft. per min., with $\frac{1}{8}$-in. allowance for machining. This $\frac{1}{8}$ in. is taken off in one roughing cut, and once over with a broad tool completes the planing operation.

The heat which is set up while machining these castings often causes distortion if they have not been cast in iron of the specified composition, viz.: T.C., 3.6; Si 2.7 to 3.0 per cent.; Mn 0.6 per cent.; S 0.1 per cent. max., and P 0.6 per cent. giving a carbon equivalent of 4.7. This is a very soft iron, showing a Brinell hardness of 183.

FIG. 7.—(*Right*) *headstock casting;* (*left*) *another casting made on the same machine; and* (*centre*) *frame side made on the Sandslinger moulding plant.*

Large aluminium guards are also rammed up on this plant, using a facing-sand mixture of Mansfield sand and 4 per cent. wood flour, and being cast in DTD.424 alloy.

Fig. 4 shows a pillar casting which is made on this plant. This casting is the main pillar for the motor-driven, single-spindle circular moulder, which is used for tonguing, grooving, jointing and tenoning, etc., as one can see, a large amount of coring-up is required, and a skin-dried mould is necessary to obtain a clean and sharply defined casting. Fig. 5 shows the rear view of the 1,500-lb. Pneulec jolt-squeezed roll-over-draw machine, producing moulds in boxes, 3ft. 3 in. square, and 3 ft. 3 in. by 2 ft. 3 in. The boxes were cast in aluminium in the home foundry, and owing to their lightness are easy to handle and do not overtax the capacity of the machine. Empty box-parts are placed on a conveyor track at the side of the main track and lifted on to the machine by a small electrically-operated hoist.

Fig. 6 shows a sample mould for a headstock casting, which used to be quite a difficult casting to make until the job was put on the 1,500-lb. machine, and blocked out by cores, all of which were simple to make, and set in the mould to templates and jigs. Fig. 7 shows the headstock casting after dressing. This figure also shows another casting which is made on this machine and a frame side which is made on the machine previously mentioned. The 1,500-lb. machine, where suitable, is also used for the production of cores, and certain types of cores can be produced four to five times as quickly as hand ramming. The patterns and pattern boards are positioned in the same manner as previously explained, except that the master plate is attached to the machine and is retained for all patterns.

Vee-rope Pulleys

Approximately 12 months ago it was decided that owing to the unsuitability of the belt drives which

had been used on a number of types of machines produced, they would be converted to Vee-rope drive. The foundry was consulted upon the matter of their producing Vee-rope pulleys, or obtaining them elsewhere at an economical price with the minimum amount of waste, because of the unreliability and uncertainty which had existed previously during the stages of casting, machining and final inspection of such pulleys.

It was, therefore, decided that all Vee-rope pulleys up to 7-in. dia. should be cast in billet form or solid bar, and eight different diameters of bar were decided upon as being suitable for the various sizes of pulleys required.

These bars or billets are produced on the 1,500-lb. machine; they are rammed horizontally in specially-constructed boxes and are cast vertically. The runner and riser are combined in a circular basin core which is divided across the centre by a loose core which separates them. Metal is poured through pencil runners in one half of the basin core, and when the mould is full it rises into the runner basin and lifts the slotted core in a floating action; the runner basin performs the duty of riser and feeder.

This method of casting has saved quite a lot of waste in the cutting-off stage. The billets are 2 ft. 6 in. long and the amount of waste only varies from 2 in. to 3 in., depending on the diameter. When one considers that an average of five pulleys are produced from each billet, with a metal waste of only 15 per cent. in the foundry. and a negligible amount of bad castings, the economic advantage gained is shown to be considerable.

The metal used for the casting of these billets is a low-phosphorus, low-silicon iron; the phosphorus content being in the region of 0.20 per cent. and the silicon 1.6 per cent. Fig. 8 shows a mould ready for assembly, and one already assembled and ready for casting, the runner core is tapered so that it will not lift. Fig. 9 shows four different sizes of Vee-rope pulley, and also the billet from which they have been machined.

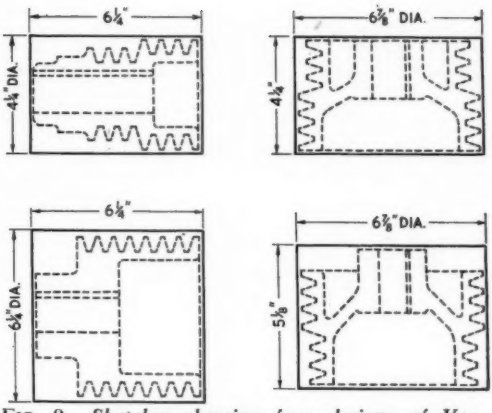


FIG. 9.—*Sketches showing four designs of Vee-rope pulleys and the billets from which they are machined.*

Economics of the Method

The moulding cost of the billets (taking into account the waste which was previously encountered), in comparison with the moulding cost of producing pulleys from plated patterns, was 33 per cent. lower, and waste was almost nil, if correct control were used in producing the low-silicon, low-phosphorous iron required. The charge make-up was as follows for a 10-cwt. charge:—270 lb. steel scrap; 360 lb. hematite, and 370 lb. return scrap. The bars when cut up to their required lengths machined up without any sign of porosity at the roots of the vees.

The machining costs are higher on 30 per cent. of the pulleys, depending on the shape required, but on the remaining 70 per cent. the machining costs show very little change from the costs which existed when castings were made with approximately ¼- to ⅜-in. machining allowance all over. Many Vee-rope pulleys originally made in steel and now made from this cast-iron billet material are saving 75 per cent. machining time.

Set against extra cost of machining of 30 per cent. of the production, there is the fact that no machining time is wasted on porous or dirty castings, which faults did not always reveal themselves until the Vees were being cut, or the hole finished bored.

Larger Sizes

The larger size of Vee-rope pulleys are all cast with a circular runner around the periphery of the

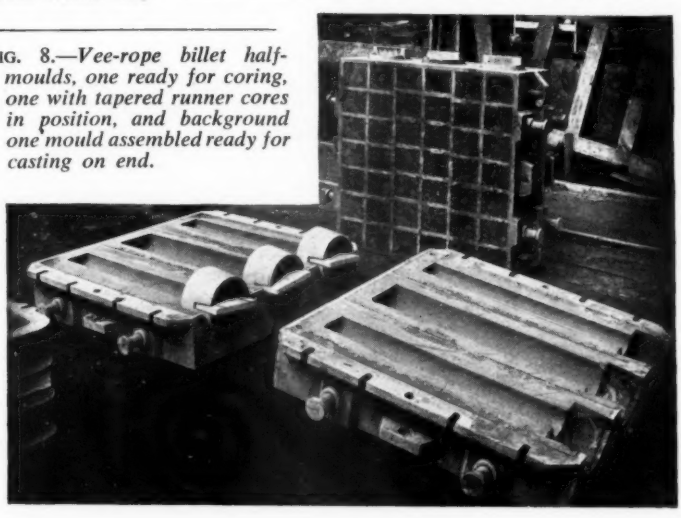


FIG. 8.—*Vee-rope billet half-moulds, one ready for coring, one with tapered runner cores in position, and background one mould assembled ready for casting on end.*

FIG. 10.—*Vee-rope pulleys, those in the foreground produced from billets and the others from individual moulds incorporating ring runners.*

casting, and only $\frac{1}{8}$ in. between inside of runner and outside diameter of casting. Small flash ingates control the speed of casting the mould, the total area of the ingates being less than the area of the downgate in order that the metal will fill the circular runner, and so cause metal to enter the mould equally all the way around. Equable rates of solidification and cooling are the aim of this runner.

The thickness of the rim of Vee-rope pulleys does not always suit running on the boss. When a pulley with a thick rim is run on its boss, the hot metal is constantly running over the bottom projection of sand until the mould is finish poured, thus creating hot areas of sand where the plate connects with rim and boss. This assists in producing hot spots, whilst the casting is solidifying because of the poor conductivity of the sand—thereby assisting in causing internal porosity. The rim-running method overcomes this trouble by using a more rapid casting speed, by assuring that the hottest metal enters at the top of the casting, and not continually running metal over the same area of sand. The composition of the metal is always the most important factor to control, and it must be of the strictest character. Fig. 10 shows a selection of Vee-rope pulleys produced by the methods mentioned. Those in foreground are cast from bar, and the remainder, as explained, with ring runners.

(To be continued)

New Film Strips

A new series of " sound " film strips, designed to help solve industry's production problems, has now been issued by the Industrial Welfare Society, 48 Bryanston Square, London, W.1. They are:—(1) "*The Executive Who Wasn't*"—A study of the overworked executive and his need to plan, to delegate, to relax—in fact to be efficient. (2) "*Work and Welfare*"—Puts the problem of a firm which provides generous amenities for its workers without corresponding increases in output. (3) "*The Higher The Fewer*"—How the highly-placed executive is in danger of losing touch with his workers and even perhaps with his own position relative to the whole industrial unit. (4) "*Papers and People*"—Bureaucracy in the firm destroys the workers' sense of " mattering " and tends to lower morale. (5) "*Technical Hitches*"—The relationships between technicians and the administration are strengthened by better understanding of each other's rôle in the firm and of industrial relations generally. (6) "*Tool-Room Trouble*"—Craftsmen's reactions to replanning analysed. How to put across new ideas on organization without harming morale. (7) "*Stick-in-the-Mud*"—Resistance to new ideas—in the home and at the works. A strikingly illustrative parallel.

Bronze and Brass Founders' Advisory Service

Bronze and Brass Founders in the Lancashire and Cheshire area are invited to attend advisory service meetings arranged by the Association of Bronze and Brass Founders on January 10, and March 7, 1955. The subjects of the talks will be: " Sands " and " Foundry Layout " respectively and details will be published in due course.

Imported Oil-burning, Brazing and Blow-lamps

The Standing Committee appointed by the Board of Trade will hold a Public Enquiry at the Board of Trade Offices, Horse Guards Avenue, London, S.W.1, on Tuesday, November 23, at 10.30 a.m. to consider whether the following imported goods should be required to bear an indication of origin:—Paraffin pressure and non-pressure operated heating, boiling, cooking and lighting appliances together with independent burner units for use therein, and petrol and paraffin operated brazing and blow lamps.

The Board of Trade announced on September 27, 1954, that they had been asked to recommend the making of an Order-in-Council under section 2 of the Merchandise Marks Acts, 1926, and had referred the request to the Standing Committee. Communications regarding the enquiry should be addressed to the secretary, Merchandise Marks Committee, Board of Trade, as soon as possible at the address quoted.

I.A.E.S.T.E.

The seventh annual report of the International Association for the Exchange of Students for Technical Experience shows that the movement continues to grow and that last year no fewer than 4,267 students took advantage of the facilities offered. The tendency is now clearly shown for the great industrial countries to receive more students than they send abroad. Thus for the lesser-developed countries, it is becoming a one-way traffic and not an exchange—or at least a unilateral one. The report is available to readers on writing to Mr. J. Newby, Imperial College, South Kensington, London, S.W.7.

Personal

MR. FREDERICK P. WEBSTER has joined the Board of H. and J. Hill (Willenhall), Limited, and its subsidiary, George Dyke and Son (Willenhall).

BRITISH INSULATED CALLENDER'S CABLES, LIMITED, announce the appointment of MR. E. S. MACKAY as manager of their Leicester branch office.

MR. JOHN LEWIS, head cashier at the Albion Works, Sheffield, of Thos. W. Ward, Limited, has received a presentation from the directors and staff on completing 50 years with the company.

MR. W. A. C. NEWMAN, who has retired as chemist and assayer of the Royal Mint, has joined Riley, Harbord & Law, consulting metallurgists and chemists, of London, S.W.1.

DR. J. W. ARMIT, who retired in January as chairman of the Wilton Council of Imperial Chemical Industries, Limited, has received a presentation on behalf of Tees-side industrialists in recognition of his efforts for the welfare of the district.

SIR LEONARD LORD, K.B.E., chairman and managing director of the British Motor Corporation, has been elected vice-president of the Institution of Production Engineers and president-elect. Sir Leonard will take up office as president on July 1, 1955.

R. T. ("DICK") SPOONER, the Warwickshire wicket-keeper and left-hand bat, who has twice toured abroad with M.C.C. sides, and visited India with the Commonwealth XI, is to take up a business appointment which, for the time being, will run parallel with, and permit him to continue, his cricket career. He has become a sales representative covering the Midlands area, on the staff of Head, Wrightson & Company, Limited, of Thornaby-on-Tees.

MR. F. M. JONES has been appointed as assistant to the sales director, Mr. H. C. Wilson Bennetts, of Allied Ironfounders, Limited, to fill the vacancy caused by the death of Mr. J. C. Sharp. Mr. Jones joined the Coalbrookdale Company in 1928, becoming area representative for Wales in 1934. After the war he was appointed area representative for Allied Ironfounders in the home counties and became area sales manager of south and south-east England, excluding London, in the autumn of 1953. His new appointment brings him to the group's head office, 28, Brook Street, London, W.1.

MR. EDGAR J. THACKERAY, clerk to the Faculty of Metallurgy of Sheffield University since 1917, when the Faculty was inaugurated, retires on November 12 after 50 years' service in the Department of Metallurgy. He started in 1904, when nearly 16, as a junior clerk in the department. He was clerk to the late Professor Arnold; there were then only nine students in the department, now there are 108. On the day of his retirement he will be the guest of past and present students and staff at a reunion dinner. He has been secretary of the Sheffield Society of Engineers and Metallurgists since 1917 and will continue in this office.

MR. GEORGE DOWTY is to receive the honorary freedom of Cheltenham and thus will become the first industrialist to be accorded the honour, which is "in recognition of the outstanding and distinguished services rendered by him in the field of industry and to the progress of the life of the town over many years." Founder of the Dowty group of companies, Mr. Dowty, now aged 53, founded his business 24 years ago. To-day the Dowty group employs some 3,000 workers in the Cheltenham and Tewkesbury areas and controls factories at Coventry, in Canada, U.S.A. and Australia. Mr. Dowty who will be the 15th on Cheltenham's roll of Freemen, was president of the Royal Aeronautical Society from 1952-53.

Now on his annual visit to Britain is DR. JOHN FAIRFIELD THOMPSON, chairman of the International Nickel Company of Canada, Limited. He joined Inco in 1906 as metallurgist, to design and operate a research laboratory at the company's Orford Works for the investigation of the potentialities of the nickel/copper alloy, Monel, which had just been developed. That was the company's first research laboratory. In 1928, he was elected assistant to the president; he became director in 1931, vice-president in 1932, executive vice-president in 1936, president in 1949, and chairman, in addition to president, in 1951. In May, 1952, Dr. Thompson relinquished the presidency, continuing as chairman and chief officer of the company.

Obituary

MR. CHARLES RICHARD PROBERT, of Walsall, collapsed and died at work at Charles Perks, Limited, iron-founders, of Croft Street, Willenhall, on October 28.

SIR WALLACE AKERS, F.R.S., who retired last year as research director of Imperial Chemical Industries, Limited, died last week at the age of 66. In 1911 he began his career with Brunner Mond & Company, one of the companies involved in the I.C.I. merger of 1926, leaving the concern in 1924 to go to the East. He returned to join I.C.I. in 1927 and was appointed a director.

LORD CLYDESMUIR died on October 31 at his home at Carluke (Lanarkshire) at the age of 60. A director of Colvilles, Limited, Glasgow, Lord Clydesmuir enjoyed a long and distinguished career in industry, politics, and public service. He belonged to the third generation of the family which conducted the steel-making firm of David Colville & Sons, Limited, being a director of the firm in intervals from high public appointments. Lord Clydesmuir, who was M.P. for North Midlothian from 1929 to 1943, served as Parliamentary Secretary to the Department of Overseas Trade before, in 1935, becoming Under-Secretary for Scotland. In the following year he took office as Financial Secretary to the Treasury and in 1938 he entered the Cabinet as Secretary of State for Scotland. A former Governor of Bombay, Lord Clydesmuir acted as Viceroy of India on four occasions.

THE DEATH occurred on November 1, at the age of 60, of SIR JOHN LENNARD-JONES, Principal of the University College of North Staffordshire since 1953. Sir John was educated at Manchester University and Trinity College, Cambridge, and after holding the appointments of lecturer in mathematics at Manchester University and Reader in Mathematical Physics at Bristol University, he was, in 1925, made Professor of Theoretical Physics in the University of Bristol. From 1930 to 1932 he was Dean of the Faculty of Science at Bristol, and in the latter year was appointed Plummer Professor of Theoretical Science in the University of Cambridge, a position which he retained until his appointment to the College. Sir John's principal contributions to physical chemistry were to the modern theory of valency and molecular structure, and much recent work in this direction is based upon papers he published in 1929. He was elected a Fellow of the Royal Society in 1933 and was awarded the Society's Davy Medal last November for his work in the field of application of quantum mechanics to the theory of valency and to the analysis of the structure of chemical compounds.

News in Brief

THE TELEPHONE NUMBER of the London headquarters of the International Harvester Company, Limited, has been changed to CLErkenwell 8422.

THE AUSTRALIAN BRANCH (Victoria) of the Institute of British Foundrymen recently had an evening visit to the Geelong works of the International Harvester Company.

THE 1955 Physical Society exhibition of scientific instruments and apparatus will be held in the New Hall of the Royal Horticultural Society, Westminster, from April 25 to 28.

CROMPTON PARKINSON, LIMITED, engineers, of Doncaster, have presented their 1,200 employees with increases of wages of from 3s. to 8s. a week "because of the continued prosperity of the firm."

THE NO. 3 BLAST FURNACE of Staveley Iron & Chemical Company, Limited, has been relined and relit in almost record time. The time taken from the blowing out of the furnace to the relighting was 51 days.

THE LOCKHEED HYDRAULIC BRAKE COMPANY, LIMITED, at Leamington Spa is to extend its factory on the Tachbrook Road frontage and take on another 1,000 employees. It is expected that building will begin next Spring.

THE IRON & STEEL HOLDINGS REALIZATION AGENCY has announced the sale of the Goldendale Iron Company, Limited, of Stoke-on-Trent to Mr. William Dunn, of Wolverhampton. Mr. Dunn has paid £175,600 for the company and assets.

JOHN LEWIS & SONS, LIMITED, Aberdeen, have received an order for a Diesel trawler of 117½ ft. long, from Carnie & Gibb, of Granton, trawler owners. Propelling machinery will be supplied by British Polar Engines, Limited, Glasgow.

A PROTEST is being sent from Glasgow to the headquarters of the Amalgamated Union of Foundry Workers' headquarters at Manchester against alleged irregularities in the conduct of the election for the appointment of a general secretary.

MEMBERS of the Purchasing Officers' Association recently visited the factory of G. Waddington & Son, Limited, Newland, Hull, where they were shown many of the processes by which raw hides and skins are converted into a wide range of industrial gloves.

MEMBERS of the Association of Bronze and Brass Founders in the Lancashire and Cheshire area are asked to take particular note of an important forthcoming meeting. It will be held on January 12, 1955, at the Midland Hotel, Manchester, following luncheon at 12.30 p.m.

A SURVEY on the foundry industry is being prepared by Youth Employment Officers in the Black Country area who, in order to ascertain the precise needs of industry so as to be able to give adequate vocational guidance, have formed themselves into research groups.

IMPORTS into the Tees in September totalled 353,791 tons, a fall of 76,368 tons compared with the corresponding month of last year. The decline was principally due to smaller arrivals of iron ore and coal. Exports of angles, bars, and plates increased in the same period by 5,492 tons.

THE CONTRACT for the 3,480-ft. long Auckland Harbour Bridge, to cost £3,465,000, has been signed by the bridge authority. The joint contractors are Dorman, Long & Company, Limited, and the Cleveland Bridge & Engineering Company, Limited, and construction of the bridge will begin early next year.

RUBERY, OWEN & COMPANY, LIMITED, announce that Mr. W. Lawson Hurdman, M.SC., M.I.MECH.E., M.INST.GAS.E., A.R.I.C., has joined the senior management of the Owen Organization as general production manager. Mr. Hurdman will operate from the head offices in Darlaston, South Staffordshire.

MERSEY DOCKS & HARBOUR BOARD, Liverpool, have placed an order with Lobnitz & Company, Limited, Renfrew, for a new sand hopper dredger with a capacity of 2,000 tons. When completed, the new ship will handle two-and-a-half times as much sand and silt as her predecessor, the 17-year-old Mersey No. 9.

THE COUNCIL of the Institution of Mechanical Engineers have accepted an invitation from the chairman and committee of the southern branch to hold next year's summer meeting in Southampton and district; and it is proposed that the meeting should take place during the week beginning Monday, July 4, 1955.

A SALES CONFERENCE, organized by the industrial division of Philips Electrical, Limited, was held in London recently. It was called for the purpose of discussing the company's future activities, and was attended by divisional executives, department heads, regional and branch managers, and sales engineers from all over the country.

SCOTTS' SHIPBUILDING & ENGINEERING COMPANY, LIMITED, Greenock, have received a contract from Elder Dempster Lines, Limited, Liverpool, for a cargo motorship of 10,000 tons d.w., which will be fitted with Scott-Doxford supercharged Diesel engines. The new vessel will be similar to the Ebani and Eboe, which were completed by these builders for the same owners in 1952.

Mr. GEOFFREY LLOYD, Minister of Fuel and Power, is to visit Stafford on November 19 to inaugurate the catalytic oil plant, which has been installed there to produce gas from oil. The first large-scale plant of its kind built in this country, it is an experiment by the West Midlands Gas Board to try to overcome the shortage of gasmaking coal.

STEEL, PEECH & TOZER, LIMITED, Rotherham, are presenting their 8,000 employees with a history and description of the works. It includes maps, photographs, and diagrams as well as text, and has taken a year to produce. Production has been in the hands of the welfare department. The book, gold-embossed, is being posted to the homes of employees.

IT IS ANNOUNCED by Ford Motor Company, Limited, and Ransomes Sims & Jefferies, Limited, that as from January 1, 1955, the manufacture of all the farm machinery which the two companies have jointly developed for use with the Fordson Major tractor and for sale under the F-R trade mark is to be taken over by Ransomes Sims & Jefferies, as well as the manufacture of all spare parts.

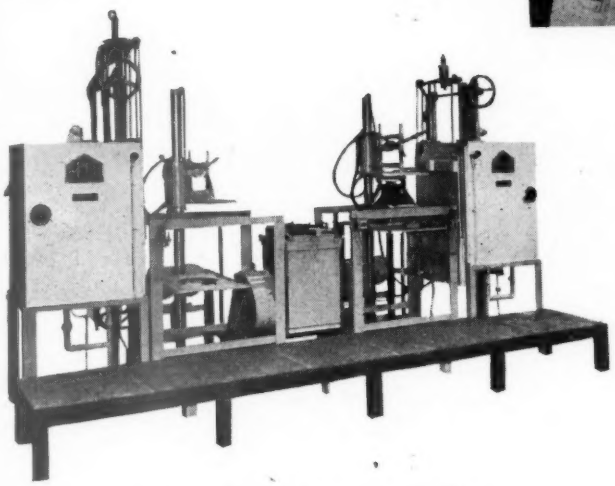
JOHN I. THORNYCROFT & COMPANY, LIMITED—The company is paying 10 per cent., to make 15 per cent., on £1,200,000 ordinary capital for the year to July 31, against a similar total on £600,000 in 1952-53. Subject to C.I.C. consent and holders' approval, £300,000 of general reserve is to be capitalized to make a free issue of one-in-four to ordinary shareholders registered on October 27.

A £260,000 multi-storey extension to Glasgow's Royal Technical College, has been approved. The governors have been granted authority for the new building which

(*Continued on page* 590)

Shell Moulding in 3D

The Shelmolda 'Altus' will handle patterns up to 13in. in height or depth and therefore will provide a greater variety of sand/resin moulds than any other machine on the British market. All the main operations are carried out mechanically and the minimum of physical effort is required from the operator.



The Shelmolda "Altus" (patent applied for)

Capacity

Effective pattern plate sizes of 16in. by 16in. and 16in. by 12in. Handles pattern plates 13in. high or 13in. deep in each oven. Will produce from split pattern 26in. overall. Oven opening adjustable up to 16in. above or below centre line.

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236/72

News in Brief

(*Continued from page* 588)

will be erected on the east side of John Street near the College. The new portion of the college, comprising an extension of the present boiler house and laboratories, will include a students' refectory, a common room and recreation rooms.

LANSING BAGNALL, LIMITED, manufacturers of materials handling equipment are to hold a two-day exhibition and film show at the Birmingham Exchange and Engineering Centre on November 24 and 25. Some of the company's latest models of industrial trucks will be on show and a team of engineers will be available to offer advice on technical problems. Two films will be shown four times a day.

AS A RESULT of a fall in export prices, the ratio of import prices to export prices declined during September, the overall index of export prices (1953 = 100) decreasing by one point to 99, the same as the average for the earlier months of the year. Metal manufactures, comprising finished steel, non-ferrous metals, and manufactures of metals other than engineering products, was the export group mainly responsible for the decline.

MADE in solid cast bronze at the Magnet Works in Landor Street, Birmingham, of the General Electric Company, Limited, eight huge lanterns, each one weighing 8¼ cwt., were completed for London's Guildhall in time for the Lord Mayor's Banquet there on November 9. The lanterns are to the design, in medieval English style, of Sir Giles Gilbert Scott. Each lantern is 8 ft. high and 6 ft. wide. The eight arms carry 24 200-watt lamps with six lamps in the body.

IN ORDER to ensure a more durable paint finish the process of tinning steel before painting is gradually being adopted by industry, especially the motor-car industry, Dr. E. S. Hedges, director of research at the Tin Research Institute, said at a conference on tin held in Essen, Germany, on November 2. "The life of painted steel is prolonged many times if the steel is coated with as little as 0.5 micron of electrodeposited tin before painting," said Dr. Hedges. "Tin is undoubtedly an excellent base for paints of all kinds and seems especially to favour good adhesion."

SIR CHARLES S. LILLICRAP, chairman of the Council of the Institute of Naval Architects and of the Council of the British Welding Research Association, presented the prizes at the annual prize-giving to apprentices of Robert Jenkins and Company, Limited, engineers, Wortley Road, Rotherham, at Rotherham Town Hall Assembly Rooms on November 5. He told the apprentices that it was essential that fine craftsmanship, combined with adequate knowledge, should continue if the country was in any way to regain the position which it once held. A. R. Bibb gained the award for the best student-engineer.

A NEW 60-ton electric arc-furnace, believed to be the biggest in Europe, was commissioned on November 3 at the Stocksbridge, near Sheffield, works of Samuel Fox and Company, Limited, a branch of the United Steel Companies, Limited. The furnace, with an inside diameter of 19 ft., will produce 60,000 tons of alloy steel a year, and make United Steel Companies the largest producers of special steel in the Commonwealth. A load of scrap was dropped into the furnace before Mr. Gerald Steel, managing director of United Steel Companies, switched on. He was presented with a silver running fox as a memento of the occasion.

Parliamentary

Dividend Restraint

When MR. CALLAGHAN asked if it was still the Chancellor's policy that there should be restraint in the distribution of dividends, and how he proposed to make his policy effective, MR. MAUDLING, Economic Secretary to the Treasury, said the answer was "Yes," and that Mr. Butler considered it was best to rely on the voluntary action of individual managements.

MR. CALLAGHAN: "As voluntary action has broken down in the sense that dividends in the last 12 months are higher than in the previous 12 months, what action does the Chancellor propose to take?"

MR. MAUDLING: "The Chancellor has always made it clear that restraint in dividends, just as in the case of personal incomes, is not the same as a complete freeze."

Replying to MR. JAY, who asked the Chancellor of the Exchequer what he proposed to ensure that a higher percentage of industrial profits was used for re-equipment, MR. MAUDLING said it must clearly be left to the managements of individual undertakings to decide how profits should be allocated; and the Chancellor trusted that in doing so they would have regard to the great importance, in the national interest, of increasing the volume of industrial investment. There were signs that the rate of industrial investment was increasing.

When VISCOUNT HINCHINGBROOKE asked if the Chancellor would take the opportunity of declaring that the payment of good dividends is one of the best ways of attracting capital for investment, MR. MAUDLING said it was a most important fact that if we were to get investment in new enterprises we must be assured of a reasonable return.

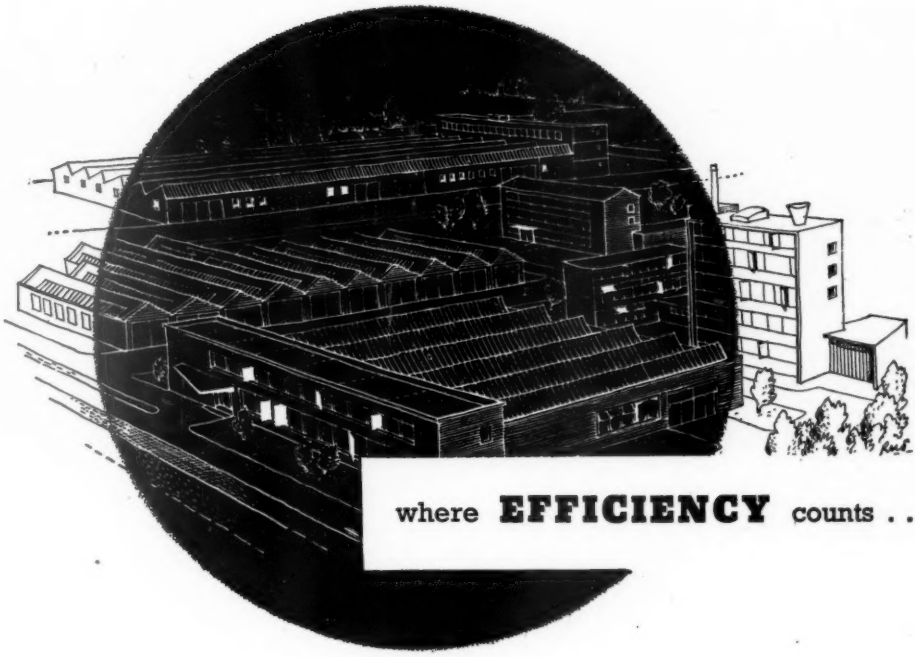
Air Pollution in London

MR. DODDS asked the Parliamentary Secretary to the Ministry of Works, as representing the Lord President of the Council, what progress had been made in the preparations to take special measurements of air pollution if smog conditions similar to those of 1952 should again occur this winter, and the purpose of taking the measurements.

In reply, MR. J. R. BEVINS said he was glad to say that detailed arrangements had now been made by the Department of Scientific and Industrial Research in co-operation with local authorities to measure smoke and sulphur dioxide and to identify other pollutants this winter in the London area. During any period of persistent smog, Civil Defence volunteers would help in taking measurements. In this way it was hoped to discover more about pollution and how it varied from area to area. Such information would be helpful in taking measures to abate pollution.

When MR. MOODY asked if the Minister was prepared, as a step towards dealing with smog, to recommend that a condition of subsidy in the future would be that all houses should be fitted with grates which will burn smokeless fuel, MR. BEVINS said that was another question which should be addressed to the Minister of Housing and Local Government.

MR. RANKIN, who asked the First Lord of the Admiralty what steps he was taking to prevent the loss of Russian shipbuilding orders to our competitors, in view of the fact that the inflow of new orders was now at a very low level, was told that it was open to British shipbuilders to compete for Russian orders, subject to certain security restrictions.



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Raw Material Markets

Iron and Steel

Orders for iron castings are now flowing more freely to the foundries. This branch of industry has been among the last to catch the trade winds, but the position is at last improving, although orders would still be welcomed by many establishments.

The low- and medium-phosphorus grades of pig-iron required for the manufacture of special castings are only obtainable in meagre quantities, but supplies of No. 3 foundry iron are quite plentiful and it is significant that exports of pig-iron to overseas destinations in September were the heaviest for any month this year. The blowing in of two Derbyshire furnaces after relining and repairs has increased supply of high-phosphorus iron and there would seem to be capacity to spare for export trade. Orders for additional tonnage for shipment have already been broken by some makers.

The allocations of foundry coke for the winter period from November 1 to April 30 have now been made, and after allowing for the normal stock uplift, the tonnages approximate to those granted for the summer months. Producers of foundry coke are generally able to satisfy demands, but some grades of Welsh foundry coke are still not plentiful.

The foundries are provided with sufficient scrap to meet current consumption needs, although there is a persistent demand for first-quality cast-iron machinery scrap. Ganister, limestone, and firebricks are received to requirements.

With British steel production now running at the annual rate of over 19,000,000 tons there is only small reliance now on foreign supplies of steel semis. Occasional shortages of billets arise, but deliveries of sheet, bars and slabs have been stepped up to meet the swollen requirements of the sheet mills. There is, however, a deficiency in the supply of wire rods, which tends to restrict the output of the wire mills at a time of maximum demand.

There is scarcely a single branch of the finished-steel trade which is not working to capacity limits. The industrial activity has given a great impetus to the demand for steel products and the strength of the export market is indicated by the fact that twice within a month the Brussels Cartel has advanced export prices.

Except in the case of sheets, steel exports are no longer subject to controls, but sales of sheets abroad are suspended pending the issue of quotas for 1955. Exceptionally heavy shipments have gone to Australia and New Zealand, and there has been a marked expansion of trade with the Argentine.

Conspicuous features of the home trade are the very heavy demands for joists and sections and the congestion of orders for the lighter gauges of sheets.

Non-ferrous Metals

Following the return to work of the dockers, the metal supply situation has improved, but it is likely to be several weeks before all the effects of the strike are overcome. Some alarm, particularly in regard to lead supplies, was expressed at the news of trouble at the Australian ports and the slightly easier price trend which had been apparent was checked. On balance the prompt quotation advanced by 15s. and forward by £1 15s., the backwardation narrowing to £5 5s. In the United States the price was unchanged at 15 cents, but the market was firm.

Zinc also firmed up on a report that the stockpiling authority was inviting offers for January delivery. In London the market was unchanged on the week and closed at £81 5s. for both positions. Zinc is now a steady market and the outlook promises little change during the coming months. The supply position is comfortable, especially now that metal is being released from the docks, and there is no need for any consumer to go short. Tin is steady, too, although there was a loss of £5 in cash last week, while three months closed £5 10s. lower.

The copper market continues to command considerable interest, for the price level is still a long way above the parity of the New York valuation of 30 cents. Last week saw a steady downward drift in the cash price, which on Friday's midday session stood at £274, a drop on the week of £11. In the afternoon, however, there was an improvement to £277 10s., mainly on better advices from the United States, where business seems to be picking up now that the elections are over. In the three months position, in which there was a good deal of business, the loss on the week was only £2, so that the backwardation, which a week earlier had been £22, was reduced to £16 10s.

Further help to U.S. copper consumers was announced in the shape of a diversion of some 25,000 tons of copper intended for the stockpile during November and December. This, it has been stated, must be replaced by the end of 1955. In the U.K. the supply of copper seems fairly adequate for this year, but wire bars may be rather scarce.

Official metal prices were as follow:—

COPPER, Standard—*Cash:* November 4, £276 10s. to £277 10s.; November 5, £273 10s. to £274; November 8, £275 to £277; November 9, £277 10s. to £280; November 10, £281 to £283.

Three Months: November 4, £262 to £263; November 5, £261 to £261 10s.; November 8, £262 to £262 10s.; November 9, £264 10s. to £265; November 10, £267 10s. to £268.

TIN, Standard—*Cash:* November 4, £726 10s. to £727; November 5, £725 to £726; November 8, £723 to £724; November 9, £719 to £719 10s.; November 10, £716 to £716 10s.

Three Months: November 4, £725 to £725 10s.; November 5, £723 to £724; November 8, £722 to £722 10s.; November 9, £717 to £717 10s.; November 10, £714 to £714 10s.

ZINC—*First half November:* November 4, £81 to £81 5s.; November 5, £81 to £81 5s.; November 8, £80 10s. to £81; November 9, £81 to £81 5s.; November 10, £81 5s. to £81 7s. 6d.

First half February: November 4, £81 to £81 5s.; November 5, £81 to £81 5s.; November 8, £80 10s. to £80 15s.; November 9, £81 to £81 5s.; November 10, £81 5s. to £81 7s. 6d.

LEAD—*Fist half November:* November 4, £108 10s. to £109; November 5, £110 to £110 5s.; November 8, £110 5s. to £110 10s.; November 9, £110 10s. to £110 15s.; November 10, £110 5s. to £111.

First half February: November 4, £104 5s. to £104 10s. November 5, £104 15s. to £105; November 8, £105 to £105 5s.; November 9, £105 5s. to £105 10s.; November 10, £105 5s. to £105 10s.

Latest Foundry Statistics

According to the Bulletin of the British Iron and Steel Federation, employment in the steel foundry industry as at August 7 was 19,337 showing a reduction of 317 since July 10, and 660 as against a year ago. The weekly average output of steel castings in July was 4,300 tons whilst in June it was 5,800 tons and 5,900 in July, 1953.

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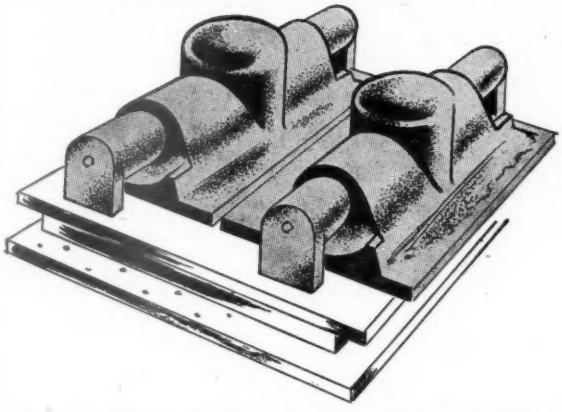

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3

Current Prices of Iron, Steel, and Non-ferrous Metals

(*Delivered unless otherwise stated*)

November 10, 1954

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £14 19s. 6d.; Birmingham, £14 12s. 9d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £17 5s. 9d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £17 16s. 9d.

Scotch Iron.—No. 3 foundry, £17 9s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £18 19s. 6d.; South Zone, £19 2s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £19 19s. 6d.; South Zone, £20 2s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £17 14s. 6d.; Scotland (Scotch iron), £18 1s. 0d.; Sheffield, £18 19s. 0d.; Birmingham, £19 6s. 6d.; Wales (Welsh iron), £18 1s. 0d.

Basic Pig-iron.—£15 10s. 6d. all districts.

FERRO-ALLOYS

(*Per ton unless otherwise stated, delivered*)

Ferro-silicon (6-ton lots).—40/55 per cent., £42 0s. 0d., basis 45 per cent. Si, scale 17s. per unit; 70/84 per cent., £65 0s. 0d., basis 75 per cent. Si, scale 18s. per unit.

Ferro-vanadium.—50/60 per cent., 23s. 8d. to 25s. 0d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 10s. 0d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £185 0s. 0d. to £195 0s. 0d. per ton; 38/40 per cent., £251 0s. 0d. to £270 0s. 0d. per ton.

Ferro-tungsten.—80/85 per cent., 13s. 10d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 16s. 10d. per lb. of W.

Ferro-chrome (6-ton lots).—4/6 per cent. C, £75 0s. 0d. to £80 0s. 0d., basis 60 per cent. Cr, scale 25s. 0d. per unit; over 6 per cent. C, £74 0s. 0d. to £76 0s. 0d., basis 60 per cent. Cr, scale 24s. 0d. per unit; 2 per cent. C,* 1s. 7½d. per lb. Cr; 1 per cent. C,* 1s. 8d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. per lb. Cr; 0.10 per cent. C,* 1s. 9¾d. per lb. Cr; 0.06 per cent. C.* 1s. 10d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 6½d. to 7s. 1d. per lb.

Metallic Manganese.—93/95 per cent., carbon-free, £225 0s. 0d. to £232 0s. 0d. per ton; 96/98 per cent., £255 0s. 0d. to £262 0s. 0d. per ton.

Ferro-columbium.—60/75 per cent., Nb + Ta, 52s. 6d. to 70s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £54 15s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £25 12s. 6d.; tested, 0.08 to 0.25 per cent. C, £26 12s. 6d.; hard (0.41 to 0.60 per cent. C), £28 0s. 0d.; silico-manganese, £33 16s. 0d.; free-cutting, £28 16s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £32 12s. 0d.; silico-manganese, £34 17s. 6d.

* Average 68-70 per cent. Cr.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £29 16s. 0d.; basic, hard, over 0.41 up to 0.60 per cent., C, £30 16s. 0d.; acid, up to 0.25 per cent. C, £33 0s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £31 1s. 6d.; boiler plates (N.-E. Coast), £32 9s. 0d.; floor plates (N.-E. Coast), £32 10s. 6d.; sectional material, N.-E. Coast, £29 4s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested, £32 7s. 0d.; flats, 5 in. wide and under, £32 7s. 0d.; hoop and strip, £33 9s. 0d.; black sheets, 17/20 g., £42 1s. 0d.; galvanized corrugated sheets, 24 g., £51 8s. 6d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £53 8s. 0d.; nickel-chrome, £75 2s. 0d.; nickel-chrome-molybdenum, £84 13s. 6d.

NON-FERROUS METALS

Copper.—Cash, £281 0s. 0d. to £283 0s. 0d.; three months, £267 10s. 0d. to £268 0s. 0d.; settlement, £283 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 32⅛d. per lb.; wire, 311s. 0d. per cwt. basis; 20 s.w.g., 342s. 3d. per cwt.

Tin.—Cash, £716 0s. 0d. to £716 10s. 0d.; three months, £714 0s. 0d. to £714 10s. 0d.; settlement, £716 10s. 0d.

Zinc.—First half November, £81 5s. 0d. to £81 7s. 6d.; first half February, £81 5s. 0d. to £81 7s. 6d.

Zinc Sheets, etc.—Sheets, 15 g. and thicker, all English destinations, £111 5s. 0d.; rolled zinc (boiler plates), all English destinations, £109 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £96 0s. 0d.

Lead (Refined Pig).—First half November, £110 15s. 0d. to £111 0s. 0d.; first half February, £105 5s. 0d. to £105 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 25⅞d. per lb.; rods, drawn 35½d.; sheets to 10 w.g., 285s. 3d. per cwt.; wire, 33d.; rolled metal, 271s. 6d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £189; B6 (85/15), £238; BS249, £192.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £219; HTB2 (30 tons), £233; HTB3 (48 tons), £243.

Gunmetal.—RCH, 3/4 per cent. tin, —; BS1400, LG2 (85/5/5/5), £236; LG3 (86/7/5/2), £244; G1 (88/10/2/½), £313; (88/10/2/1), £304.

Phosphor Bronze.—BS1400,* PB1 (AID released), £325 per ton.

Phosphor Bronze Strip, etc.—Strip, 403s. 0d. per cwt.; sheets to 10 w.g., 425s. 6d. per cwt.; wire, 49¾d. per lb.; rods, 43½d.; tubes, 41¾d.; chill cast bars: solids 44d., cored 45d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056. 3s. 5d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 10½d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 9½d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £110 0s. 0d. to £111 0s. 0d. Nickel, £483 0s. 0d. Aluminium, ingots, £156 0s. 0d.; aluminium bronze (BS1400), AB1, £285; AB2, £290. Solder, brazing, BS1845, 2s. 3d. lb.; granulated, 2s. 6d. lb.

SUPINEX "R" IN USE—

Illustration of Binnacle casting in DTD 165 alloy by courtesy of Gascoignes Non-Ferrous Foundries Ltd., Slough.

SUPINEX "R"
CORE BINDER

AN ENTIRELY NEW TYPE OF BINDER, STARTLING IN ITS PERFORMANCE . . .

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Imports and Exports of Iron and Steel in September

The following tables, based on Board of Trade returns, gives figures of imports and exports of iron and steel in September. Totals for the first nine months of this year and last are also included.

Exports of Iron and Steel

Destination.	Month ended September 30.	Nine months ended September 30.	
	1954.	1953.	1954.
	Tons.	Tons.	Tons.
Channel Islands	436	2,530	3,530
Cyprus	996	6,019	5,286
Sierra Leone	686	5,085	8,241
Gold Coast	2,493	23,106	25,966
Nigeria	4,086	28,601	44,008
Union of South Africa	5,313	74,457	35,018
Northern Rhodesia	281	12,023	3,245
Southern Rhodesia	4,174	44,236	36,601
Tanganyika	3,839	10,573	17,583
Kenya	5,086	50,935	50,167
Uganda	133	6,335	3,894
Mauritius	222	5,217	4,413
Bahrein, Qater, and Trucial Oman	1,081	15,306	16,460
Kuwait	316	10,716	4,684
India	6,600	43,829	70,038
Pakistan	7,243	19,799	44,270
Singapore	2,574	18,558	20,358
Malaya	1,615	20,074	17,273
Ceylon	1,809	12,899	14,656
British North Borneo	489	2,970	2,815
Hongkong	3,258	20,155	20,564
Australia	40,770	86,796	223,166
New Zealand	14,952	79,808	149,867
Canada	9,165	137,299	128,420
Jamaica	1,168	7,448	11,264
Trinidad	2,660	26,272	29,727
British Guiana	352	3,426	4,078
Anglo-Egyptian Sudan	2,273	16,194	24,833
Other Commonwealth countries	2,285	38,088	20,875
Eire	4,464	29,016	37,548
Soviet Union	—	8	—
Finland	4,388	21,074	47,094
Sweden	4,591	56,587	52,752
Norway	7,070	50,700	56,913
Denmark	5,165	69,398	62,911
Western Germany	6,751	5,034	11,458
Netherlands	9,709	92,846	75,169
Belgium	877	13,915	7,916
France	228	8,169	3,575
Switzerland	432	8,442	7,362
Portugal	972	12,167	9,147
Spain	862	3,510	6,670
Italy	5,573	49,039	33,404
Austria	139	1,042	1,093
Yugoslavia	835	4,017	11,159
Turkey	129	8,366	7,644
Netherlands Antilles	172	6,419	2,478
Portuguese E. Africa	224	1,789	1,951
Lebanon	283	2,984	1,514
Israel	804	5,085	6,497
Egypt	1,147	18,610	19,824
Saudi Arabia	1,321	2,261	4,289
Iraq	867	45,476	20,995
Iran	18	2,582	4,287
Burma	431	8,247	7,854
Thailand	539	7,023	5,294
Indonesia	163	10,535	3,932
Philippine Republic	214	2,363	2,493
U.S.A.	7,954	74,501	30,739
Columbia	269	7,781	6,275
Venezuela	854	30,486	25,351
Ecuador	167	1,655	2,097
Peru	672	7,190	4,200
Chile	205	1,421	1,027
Brazil	182	1,694	598
Uruguay	928	2,470	10,704
Argentina	2,978	9,023	46,746
Other foreign countries	3,358	39,478	51,354
TOTAL	202,290	1,551,217	1,733,624

Total Imports of Iron and Steel

From	Month ended September 30.	Nine months ended September 30.	
	1954.	1953.	1954.
	Tons.	Tons.	Tons.
Canada	1,003	64,394	8,022
Other Commonwealth countries and Eire	378	145,862	24,949
Sweden	1,570	19,544	29,625
Norway	2,624	42,663	23,268
Western Germany	276	30,768	40,916
Netherlands	8,407	81,747	73,136
Belgium	2,799	166,066	32,685
Luxembourg	2,543	85,545	14,912
France	1,842	203,695	49,046
Italy	—	32,003	7,473
Austria	8,041	366,698	137,806
Japan	—	56,422	55
U.S.A.	15,732	107,153	65,802
Other foreign countries	9,549	41,751	109,741
TOTAL	54,764	1,444,311	617,436
Iron and steel scrap and waste, fit only for the recovery of metal	39,087	676,260	583,737

Exports of Iron and Steel by Products

Product.	Month ended September 30.	Nine months ended September 30.	
	1954.	1953.	1954.
	Tons.	Tons.	Tons.
Pig-iron	8,488	4,362	23,816
Ferro-tungsten	11	97	361
Other ferro-alloys	633	2,037	5,924
Ingots, blooms, billets, slabs, sheet and tinplate bars	206	895	1,580
Iron bars, rods, angles, shapes, and sections	196	1,500	2,011
Steel bars, rods, angles, sections, and shapes	40,972	193,212	266,108
Iron plates and sheets	18	279	262
Universal plates	205	6,853	3,341
Steel plates, ⅛ in. and under ¼ in.	1,887	6,830	10,738
Do., ¼ in. and over	12,510	158,194	109,741
Black sheets and black plate	14,180	149,603	146,950
Hoop and strip	13,710	65,608	81,582
Tinplate	19,982	192,165	225,263
Tinned sheets, terneplate, and ternesheets	65	1,335	1,642
Decorated tinplate	235	930	2,088
Galvanized sheets	12,814	85,442	124,748
Other coated plates and sheets	584	6,989	6,366
Railway and tramway construction material	18,698	182,715	170,183
Wire rods	2,632	12,919	22,598
Wire	8,008	32,565	66,311
Tubes, pipes, and fittings	44,706	434,657	446,671
Iron castings	913	5,338	10,295
Steel castings	90	2,375	1,521
Forgings	447	4,317	3,524
TOTAL	202,290	1,551,217	1,733,624

IN A MISHAP at the foundry of Howarth and Walter, Limited, general ironfounders, Handel Street, Bradford, last month two moulders were splashed with molten metal, and one was detained at Bradford Royal Infirmary with fairly extensive metal burns to the neck and head.

TWO MOTOR coasting vessels, the total value of the order being £250,000, are to be built—one on the Clyde and one in Holland—to the order of J. & A. Gardner, shipowners, Glasgow. The vessels, each of 850 tons and 182 ft. in length, will have a speed of 11 knots. James Lamont & Sons, Port Glasgow, have secured the Clyde order, and the vessel will be engined by British Electric, Limited, of Rugby.